FIITJEE RET – 5

(2017 – 2019)(2ND YEAR_REGULAR)

IIT-2015 (P1)_SET–A

DATE: 23.07.2018

Time: 3 hours **Maximum Marks: 264**

INSTRUCTIONS:

A. General

1. This booklet is your Question Paper containing 60 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

C. Question paper format:

7. The question paper consists of **3 parts (Physics, Chemistry and Mathematics)**. Each part consists of **two sections**.
8. **Section I** contains **8 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).
9. **Section II** contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct.
10. **Section III** contains **2 Match the following** type questions and you will have to match entries in Column I with the entries in Column II

D. Marking Scheme

11. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.
12. For each question in **Section II**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **–2 marks** will be awarded for incorrect answers in this section.
13. For each question in **Section III**, you will be awarded **2 marks** for each entry in Column I; if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **–1 marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐

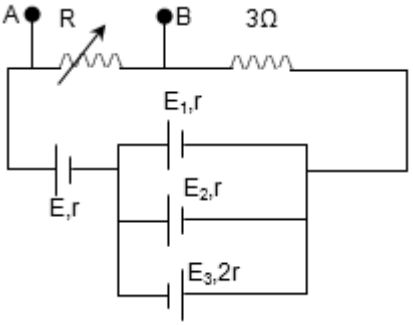
PAPER–I
PART I: PHYSICS
SECTION 1 (Maximum Marks: 32)

- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

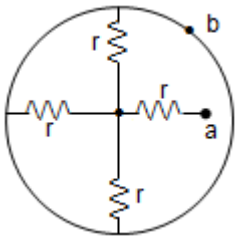
1. A rod has non-Ohmic behavior given by $I = 0.2\ V^{1/2}$, where V is the potential difference across it and I the current (both in SI units). The rod is connected in series with a Ohmic resistance (R) and a 6 V battery of negligible internal resistance. What is the value of resistance R such that the power dissipated in the rod is twice that dissipated in the resistor.

2. A 10 V car battery with negligible internal resistance is connected to a series combination of a 4Ω resistor that obeys Ohm's law and a thermistor that does not obey Ohm's law, but instead has a current –voltage relation $V = \alpha I + \beta I^2$ with $\alpha = 2\Omega$ and $\beta = 4\Omega/A$. The current through the 4Ω resistor is ?

3. Consider the electrical circuit shown. For R = 10 Ω power developed between A and B maximum. Find the value of r.

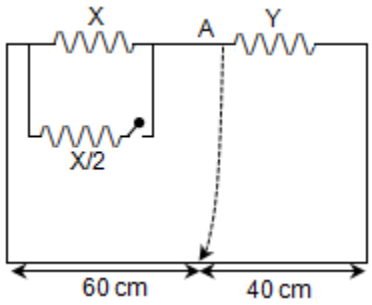


4. Find the equivalent resistances of the networks shown in figure between the points a and b if r = 3.



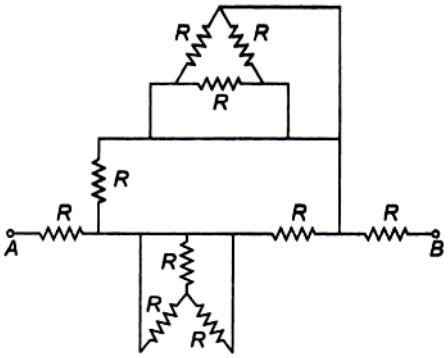
Space for rough work

5. When two resistances X and Y are put in the left hand and right hand gaps in a meter bridge, the null point is at 60cm. If X is shunted by a resistance equal to half of itself then the shift in the null point is $\frac{20}{3}$x. find x.

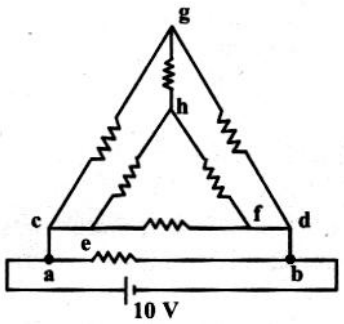


6. The current in a circuit containing a battery connected to 2Ω resistance is 0.9 A. When an additional resistance of 8Ω is connected to the same battery, the current observed in the circuit is 0.3A. Then the internal resistance of the battery is $x\Omega$. Find value of x.

7. Equivalent resistance between points A and B is 0.5 xR. Find value of x.



8. Consider the network shown in the figure. All resistance are equal to 2Ω. Find the potential difference between (in Volt) points e and h.

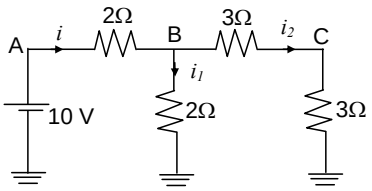


Space for rough work

SECTION 2 (Maximum Marks: 40)

- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

9. In the circuit shown, the direction of current is shown in all the branches



(A) $i_2 = \frac{5}{7}$ A (B) $i_1 = \frac{1}{7}$ A

(C) $V_B = \frac{30}{7}$ volt (D) $V_C = \frac{10}{7}$ volt

10. When no current is passed through a conductor,

(A) the free electrons do not move

(B) the average speed of a free electron over a large period of time is zero

(C) the average velocity of a free electron over a large period of time is zero

(D) the average of the velocities of all the free electrons at an instant is zero

11. Two heaters designed for the same voltage V have different power ratings. When connected individually across a source of voltage V, they produce H amount of heat each in times t_1 and t_2 respectively. When used together across the same source, they produce H amount of heat in time t.

(A) If they are in series, $t = t_1 + t_2$ (B) If they are in series, $t = 2(t_1 + t_2)$

(C) If they are in parallel, $t = \frac{t_1 t_2}{(t_1 + t_2)}$ (D) If they are in parallel, $t = \frac{t_1 t_2}{2(t_1 + t_2)}$

12. A micrometer has a resistance of 100Ω and full scale range of 50 μA. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combination (s).

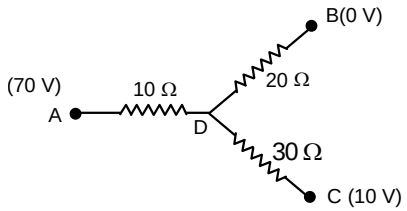
(A) 50 V range with $10k\Omega$ resistance in series (B) 10 V range with $200k\Omega$ resistance in series

(C) 5 mA range with 1Ω resistance in parallel (D) 10 mA range with 1Ω resistance in parallel

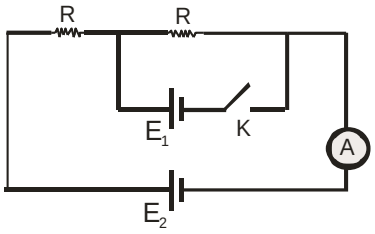
Space for rough work

13. A voltmeter and an ammeter are connected in series to an ideal cell of emf E. The voltmeter reading is V and the ammeter reading is I.
(A) V < E
(B) the voltmeter resistance is E/I.
(C) the potential difference across the ammeter is (E – V).
(D) Voltmeter resistance plus ammeter resistance = E/I.

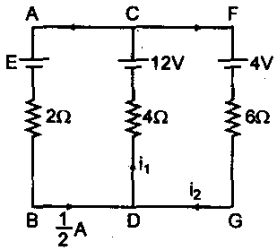
14. In the network shown, points *A*, *B* and *C* are at potentials of 70 V, zero and 10 V respectively.
(A) Point *D* is at a potential of 40 V.
(B) The currents in the sections AD, DB, DC are in the ratio 3 : 2 : 1
(C) The currents in the sections AD, DB, DC are in the ratio 1 : 2 : 3
(D) The network draws a total power of 200 W



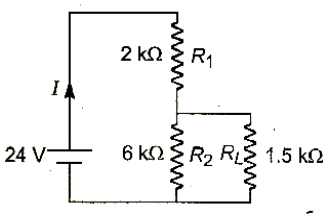
15. In the given circuit, when key K is open the reading of ammeter is I. Now key K is closed. Then the correct statement is (both the batteries have negligible resistance):
(A) If E_1 = IR, reading of the ammeter is I.
(B) If IR < E_1 < 2IR , reading of the ammeter is greater than I.
(C) If E_1 = 2IR, reading of the ammeter will be zero.
(D) Reading of the ammeter will not change.



16. In the circuit shown in figure:
(A) E =6.6V (B) i_1 = 1.1 A
(C) i_2 = 0.5 A (D) E =4.4V

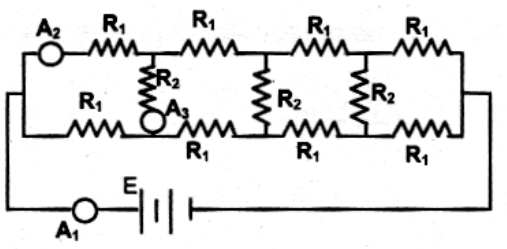


17. For the circuit shown in the figure
(A) the current I through the battery is 7.5 mA
(B) the potential difference across R_L is 18 V
(C) ratio of powers dissipated in R_1 and R_2 is 3
(D) if R_1 and R_2 are interchanged, magnitude of the power dissipated in R_L will decrease by a factor of 9



Space for rough work

18. In the given circuit, $R_1 = 10\Omega, R_2 = 6\Omega$ and $E = 10V$. Then, the correct statement(s) is /are.



(A) Effective resistance of the circuit is 20Ω

(B) Reading of A_1 is 1/2 amp

(C) Reading of A_2 is 1/4 amp

(D) Reading of A_3 is 1/8 amp

SECTION 3 (Maximum Marks: 16)

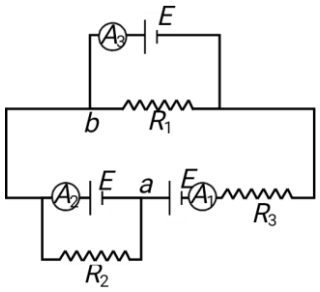
- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4×5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  - **+2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–1** In all other cases.

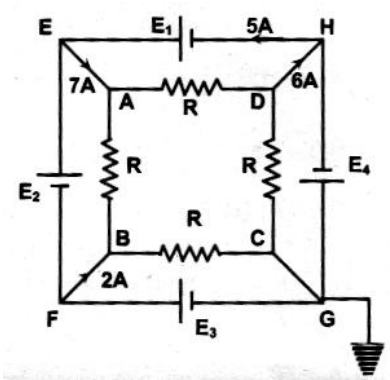
Space for rough work

19. In the circuit shown in figure, $R_1 = R_2 = R_3 = 3\Omega$ and e.m.f. of each cell is $E = 4V$ and negligible internal resistance. All ammeters are ideal. Match the following:



Column I		Column II
(A)	Reading of ammeter A_1 in ampere is	p. 4/3
(B)	Reading of ammeter A_2 in ampere is	q. 8/3
(C)	Reading of ammeter A_3 in ampere is	r. 4
(D)	Potential difference between point *a* and point *b* in volt is	s. zero t. 2

20. Figure shows an electric circuit contain four resistors of equal resistance 4Ω. Cells E_1, E_2, E_3 are ideal of unknown emf where as cell E_4 has some unknown internal resistance and emf 4V. It is found that current through EA, DH, FB and HE are 7A, 6A, 2A and 5A respectively. Then match the following



Column – I		Column – II	
(A)	Internal resistance of E_4 is	(p)	2
(B)	Current through DC is	(q)	5.5
(C)	Current through AD is	(r)	0.5
(D)	Emf of E_2 is	(s)	6

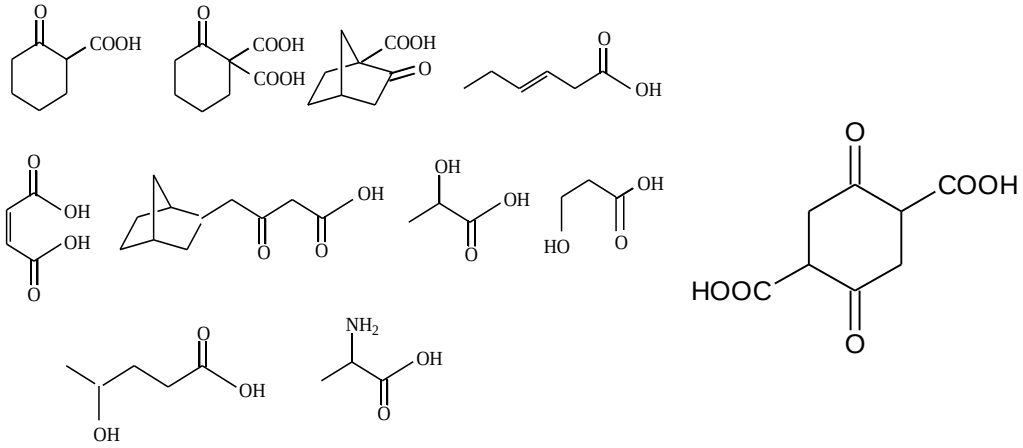
Space for rough work

PART II: CHEMISTRY

SECTION 1 (Maximum Marks: 32)

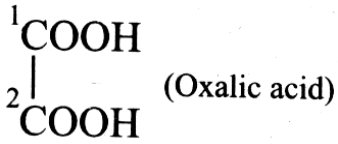
- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

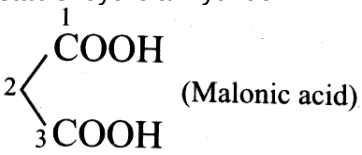
21. How many of the following compounds can undergo decarboxylation on strong heating.

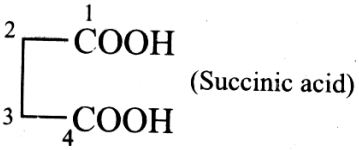


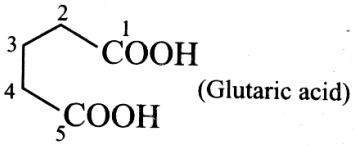
Space for rough work

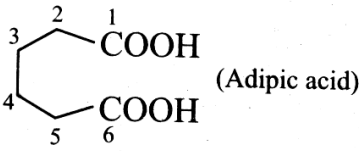
22. How many of the following dicarboxylic acids on heating forms stable cyclic anhydride

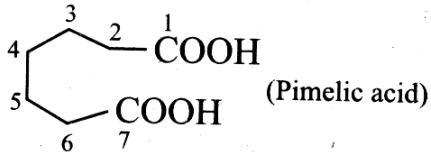
(A)  (Oxalic acid)

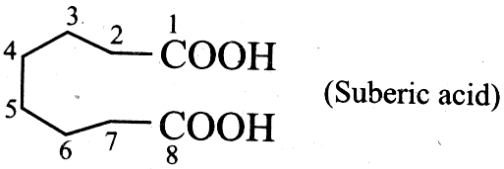
(B)  (Malonic acid)

(C)  (Succinic acid)

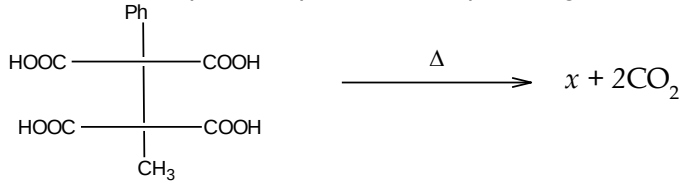
(D)  (Glutaric acid)

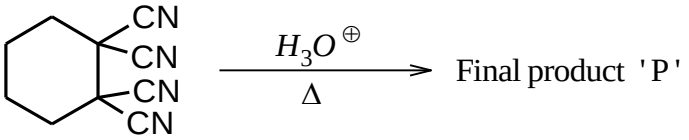
(E)  (Adipic acid)

(F)  (Pimelic acid)

(G)  (Suberic acid)

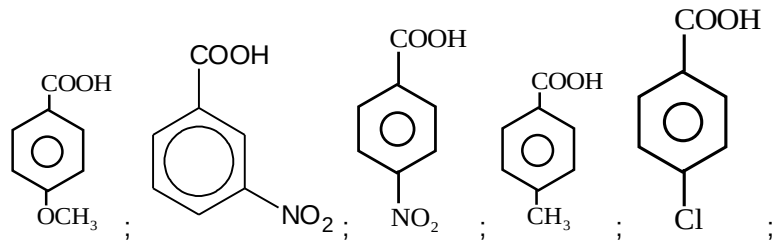
23. The number of products possible for x (including stereomers)in the following reaction is:



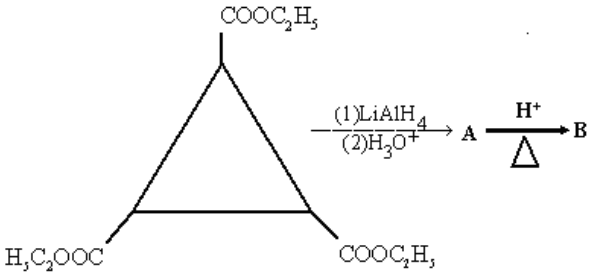
24. 

Number of oxygen atoms in the final product P are

25. The number of acids which are more acidic than benzoic acid.

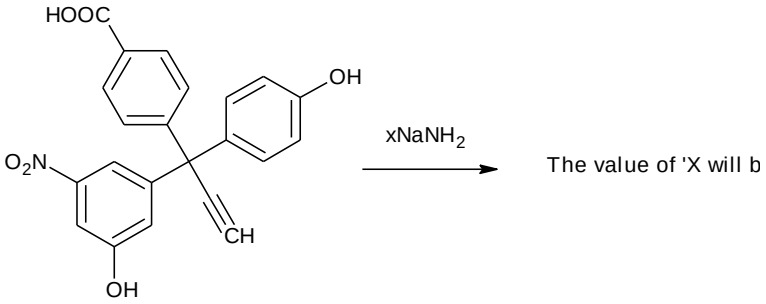
CH_3COOH; 

26.



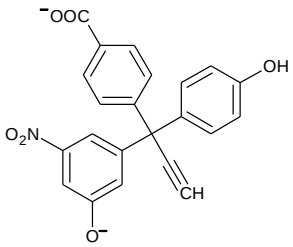
Number of hybrid orbitals on each carbon atom of in the ring of B are

27.

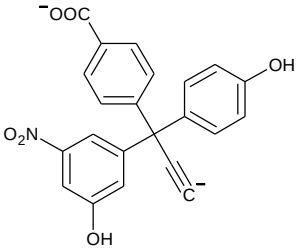


The value of 'X will b

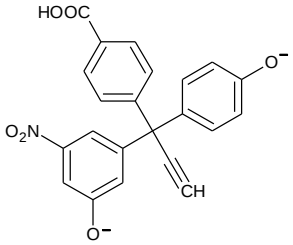
(A)



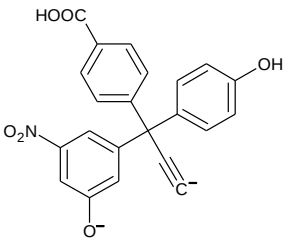
(B)



(C)



(D)



28. How many of the following reactions can takes place through nitrene intermediate ?

(1) Curtius reaction (2) Schmidt reaction

(3) Hoffmann–Bromamide reaction (4) Arndt–Eistert reaction

Space for rough work

SECTION 2 (Maximum Marks: 40)

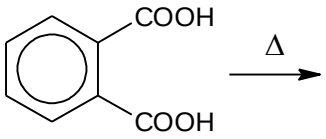
- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

29. Acid anhydride can be prepared by :

(A) $C_6H_5COOH + CH_3COCl \xrightarrow{\text{Pyridine}}$

(B) $C_6H_5COO^{(-)}Na^{(+)} + C_6H_5COCl \longrightarrow$

(C) $C_6H_5CONH + CH_3COO^{(-)}Na^{(+)} \longrightarrow$

(D) 

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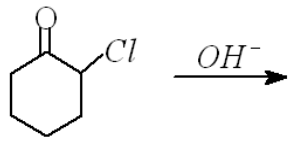
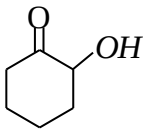
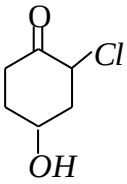
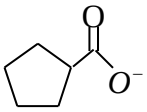
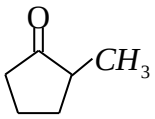


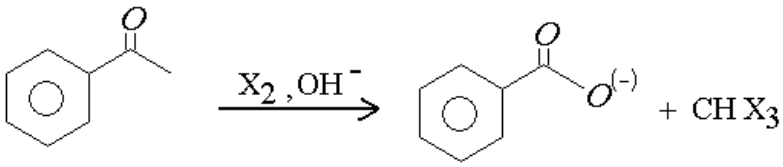
X. Find the product 'X'

(A) 

(B) 

(C) 

(D) 

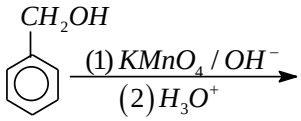
31. 

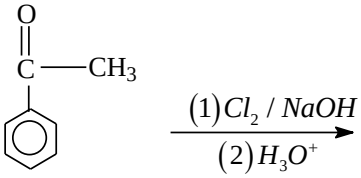
Which of the following is correct comparison of rate of haloform reaction with various halogens?

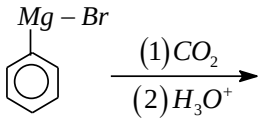
(A) $r_{Cl_2} > r_{Br_2} > r_{I_2}$ (B) $r_{I_2} > r_{Br_2} > r_{Cl_2}$ (C) $r_{Br_2} > r_{Cl_2} > r_{I_2}$ (D) $r_{Cl_2} \approx r_{Br_2} \approx r_{I_2}$

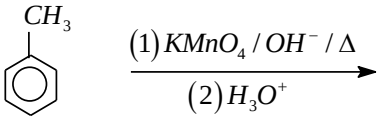
Space for rough work

32. In which of the following reactions benzoic acid is the product?

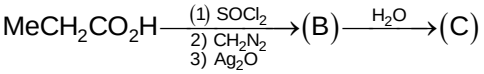
(A) 

(B) 

(C) 

(D) 

33. The rearrangements in which the alkyl isocyanate (RNCO) is formed as an intermediate is are
(A) Hoffmann-bromamide reaction (B) Schmidt reaction (C) Curtius reaction (D) Lossen reaction

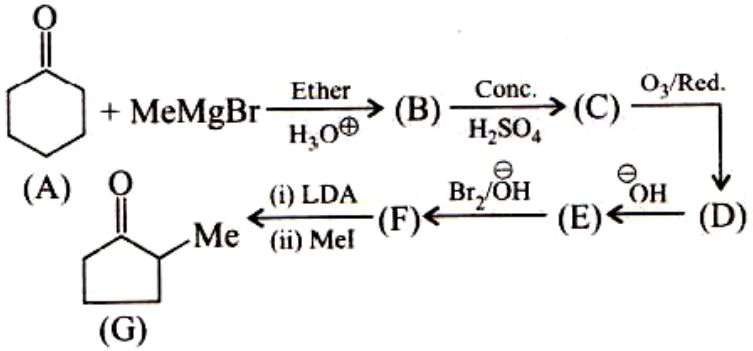
34. 

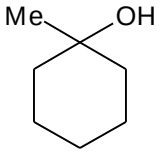
Which of the following statements are correct about the given reaction.
(A) B, C are Me–CH=C=O and $MeCH_2CO_2Me$
(B) B, C are $MeCH_2CH=C=O$ and $MeCH_2CH_2CO_2H$
(C) Wolff rearrangement reaction is involved
(D) Reaction is known as Arndt –Eistert homologation reaction.

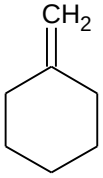
35. Which of the following compounds can reduce Tollen's agent?
(A) $HCOOH$ (B) CH_3COCH_2OH (C) $CH_3-\underset{\underset{O}{\|}}{C}-CH_3$ (D) CH_3CH_2CHO

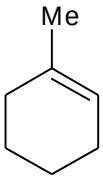
Space for rough work

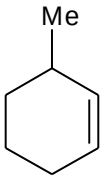
36. Compound (C) is :



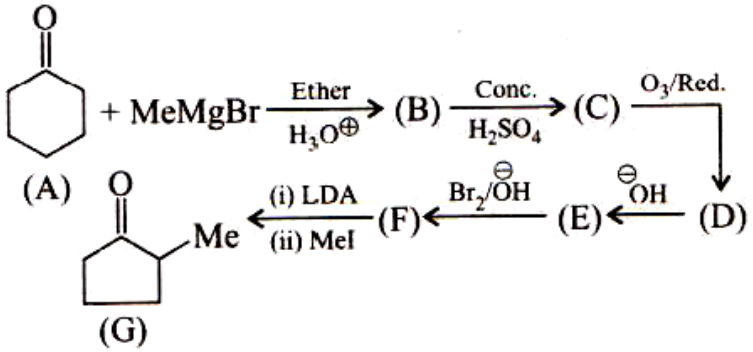
(A) 

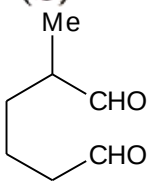
(B) 

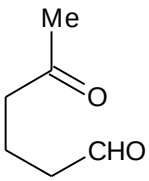
(C) 

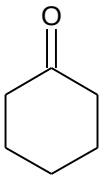
(D) 

37. Compound (D) is :



(A) 

(B) 

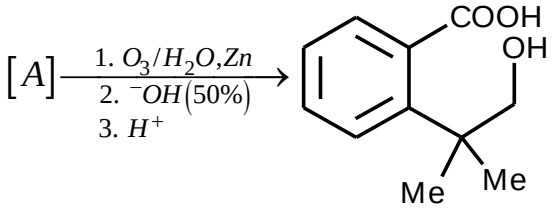
(C) 

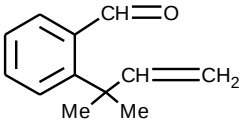
+ $CH_2 = O$

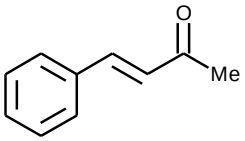
(D) Both (a) and (b)

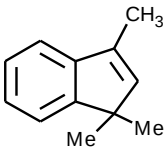
Space for rough work

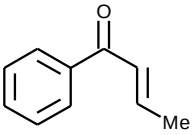
38. Which of the following is correct about (A) ?



(A) Compound A in above reaction is 

(B) Compound A in above reaction is 

(C) Compound A in above reaction is 

(D) Compound A in above reaction is 

Space for rough work

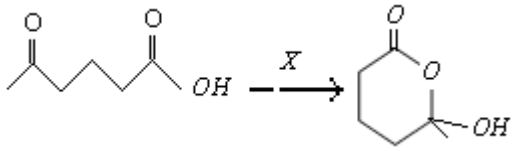
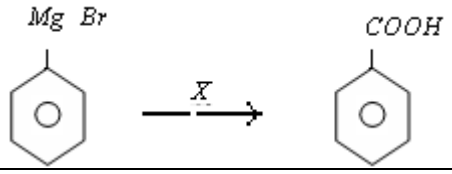
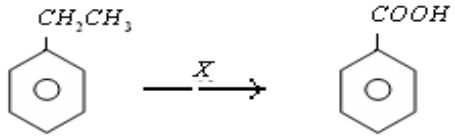
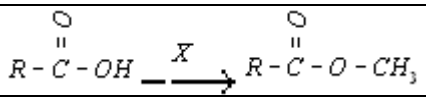
SECTION 3 (Maximum Marks: 16)

- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4 × 5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

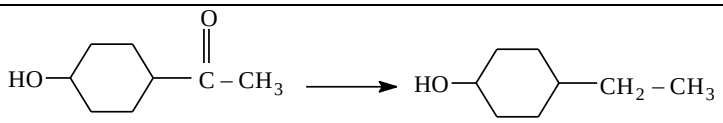
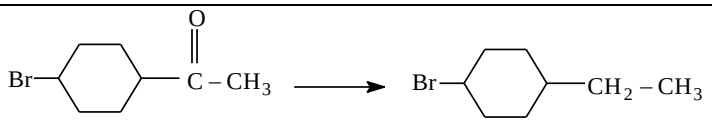
- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  - **+2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–1** In all other cases.

39.

Column – I		Column – II	
(A)		(p)	CO_2 / H_2O
(B)		(q)	CH_2N_2
(C)		(r)	$NaBH_4 / H_2O$
(D)		(s)	$KMnO_4 / OH^-$

Space for rough work

40.

Column – I		Column – II	
(A)	$R-X \rightarrow R-H$	(p)	$Zn-Hg$ / conc.HCl
(B)		(q)	CH_3Li
(C)		(r)	Bu_3SnH
(D)	$RCOOH \rightarrow RCOCH_3$	(s)	$NH_2-NH_2 / \overset{\ominus}{O}H$

PART III: MATHEMATICS

SECTION 1 (Maximum Marks: 32)

- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

41. If the length of the latus rectum of the parabola $169\{(x-1)^2+(y-3)^2\} = (5x-12y+17)^2$ is L, then the value of $\frac{13L}{4}$ is

42. $y = x + 2$ is any tangent to the parabola $y^2 = 8x$. The ordinate of the point P on this tangent such that the other tangent from it which is perpendicular to it is

43. The focal chord of $y^2 = 16x$ is tangent to $(x-6)^2 + y^2 = 2$. Then the possible value of the square of slope of this chord is

44. The equation of the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is $ax + by + c = 0$. Then the value of $a + b + c$ is

45. If the point P(4, –2) is one end of the focal chord PQ of $y^2 = x$, then the slope of the tangent at Q is

Space for rough work

46. Consider the locus of centre of the circle which touches the circle $x^2 + y^2 = 4$ and the line $x = 4$. The distance of the vertex of the locus from the origin is

47. If on a given base BC [B(0, 0) and C(2, 0)], a triangle described such that the sum of the tangents of the base angles is 4, then the equation of the locus of the opposite vertex A is a parabola whose directrix is $y = k$. The value of $8k – 9$ is

48. If the circle $(x – 6)^2 + y^2 = r^2$ and the parabola $y^2 = 4x$ have maximum number of common chords, then the least integral value of r is

SECTION 2 (Maximum Marks: 40)

- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

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49. The equations of the directrix of the parabola with vertex at the origin and having the axis along the x-axis and a common tangent of slope 2 with the circle $x^2 + y^2 = 5$ is (are)
(A) $x = 10$ (B) $x = 20$ (C) $x = –10$ (D) $x = –20$

50. Tangent is drawn at any point (x_1, y_1) other than the vertex on the parabola $y^2 = 4ax$. If tangents are drawn from any point on this tangent to the circle $x^2 + y^2 = a^2$ such that all the chords of contact pass through a fixed point (x_2, y_2) then
(A) x_1, a, x_2 are in GP (B) $\frac{y_1}{2}$, a, y_2 are in GP (C) $-4, \frac{y_1}{y_2}, \frac{x_1}{x_2}$ are in GP (D) $x_1x_2 + y_1y_2 = a^2$

51. If the focus of the parabola $x^2 – ky + 3 = 0$ is (0, 2), then a value of k is (are)
(A) 4 (B) 6 (C) 3 (D) 2

52. Let P be a point whose coordinates differ by unity and the point does not lie on any of the axes of reference. If the parabola $y^2 = 4x + 1$ passes through P, then the ordinate of P may be
(A) 3 (B) –1 (C) 5 (D) 1

53. If $y = 2$ is the directrix and (0, 1) is the vertex of the parabola $x^2 + \lambda y + \mu = 0$, then
(A) $\lambda = 4$ (B) $\mu = 8$ (C) $\lambda = –8$ (D) $\mu = 4$

Space for rough work

54. The parabola $y^2 = 4x$ and the circle having its centre at (6, 5) intersect at right angle. The possible point of intersection of these curves can be
(A) (9, 6) (B) $\left(2,\sqrt{8}\right)$ (C) (4, 4) (D) $\left(3,2\sqrt{3}\right)$

55. A quadrilateral is inscribed in a parabola. Then
(A) the quadrilateral may be cyclic
(B) diagonals of the quadrilateral may be equal
(C) all possible pairs of adjacent sides may be perpendicular
(D) none of these

56. The locus of the midpoint of the focal distance of a variable point moving on the parabola $y^2 = 4ax$ is 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 coordinates (a, 0)

57. Which of the following line can be tangent to the parabola $y^2 = 8x$?
(A) $x - y + 2 = 0$ (B) $9x - 3y + 2 = 0$ (C) $x + 2y + 8 = 0$ (D) $x + 3y + 12 = 0$

58. If two distinct chords of a parabola $y^2 = 4ax$ passing through (a, 2a) are bisected on the line $x + y = 1$, then the length of the latus rectum can be
(A) 2 (B) 1 (C) 4 (D) 3

Space for rough work

SECTION 3 (Maximum Marks: 16)

- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4 × 5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  - **+2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–1** In all other cases.

59. Consider the parabola $(x-1)^2 + (y-2)^2 = \dfrac{(12x-5y+3)^2}{169}$

Column I		Column II	
(A)	Locus of point of intersection of perpendicular tangent	p.	$12x - 5y - 2 = 0$
(B)	Locus of foot of perpendicular from focus upon any tangent	q.	$5x + 12y - 29 = 0$
(C)	Line along which minimum length of focal chord occurs	r.	$12x - 5y + 3 = 0$
(D)	Line about which parabola is symmetrical	s.	$24x - 10y + 1 = 0$

60. Match the following

Column I		Column II	
(A)	Tangents are drawn from point (2, 3) to the parabola $y^2 = 4x$. Then the points of contact are	p.	(9, –6)
(B)	From a point P on the circle $x^2 + y^2 = 5$, the equation of chord of contact to the parabola $y^2 = 4x$ is $y = 2(x - 2)$. Then the coordinate of point P will be	q.	(1, 2)
(C)	P(4, –4) and Q are points on the parabola $y^2 = 4x$ such that the area of ΔPOQ is 6 sq. units, where O is the vertex. Then the coordinates of Q may be	r.	(–2, 1)
(D)	The common chord of the circle $x^2 + y^2 = 5$ and the parabola $6y = 5x^2 + 7x$ will pass through points (s)	s.	(4, 4)

pace for rough work

FIITJEE RET – 5

(2017 – 2019)(2ND YEAR_REGULAR)

IIT-2015 (P1)_SET–A

DATE: 23.07.2018

ANSWERS

PHYSICS

1.	**5**	2.	**1**	3.	**5**	4.	**4**
5.	**4**	6.	2	7.	**5**	8.	**5**
9.	**A,C**	10.	**C,D**	11.	**A,C**	12.	**B,C**
13.	**A,C,D**	14.	**A,B,D**	15.	**A,C**	16.	**A,B**
17.	**A,D**	18.	**A,B,C**	19.	**A – p; B – q; C – s; D – r**		
20.	**A – p; B – r; C – q; D – s**						

CHEMISTRY

21.	**5**	22.	**2**	23.	**4**	24.	**3**
25.	**3**	26.	**3**	27.	**4**	28.	**3**
29.	**A, B, D**	30.	**C**	31.	**D**	32.	**A, B, C, D**
33.	**A, B, C, D**	34.	**B, C, D**	35.	**A, B, D**	36.	**C**
37.	**B**	38.	**A**	39.	**A → r ; B → p ; C → s ; D → q**		
40.	**A → r ; B → s ; C → p ; D → q**						

MATHEMATICS

41.	**7**	42.	**0**	43.	**1**	44.	**3**
45.	**4**	46.	**3**	47.	**8**	48.	**5**
49.	**AC**	50.	**BCD**	51.	**BD**	52.	**AC**
53.	**AD**	54.	**AC**	55.	**AB**	56.	**ABCD**
57.	**ABC**	58.	**ABD**	59.	**A → r; B → s; C → p; D → q**		
60.	**A → q, s; B → r; C → p, q; D → q, r**						

FIITJEE RET – 5

(2017 – 2019)(2ND YEAR_REGULAR)

IIT-2015 (P1)_SET–B

DATE: 23.07.2018

Time: 3 hours **Maximum Marks: 264**

INSTRUCTIONS:

A. General

1. This booklet is your Question Paper containing 60 questions.
6. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
7. Fill in the boxes provided for Name and Enrolment No.
8. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
9. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

C. Question paper format:

14. The question paper consists of **3 parts (Physics, Chemistry and Mathematics)**. Each part consists of **two sections**.
15. **Section I** contains **8 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).
16. **Section II** contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct.
17. **Section III** contains **2 Match the following** type questions and you will have to match entries in Column I with the entries in Column II

D. Marking Scheme

18. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.
19. For each question in **Section II**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **–2 marks** will be awarded for incorrect answers in this section.
20. For each question in **Section III**, you will be awarded **2 marks** for each entry in Column I; if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **–1 marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

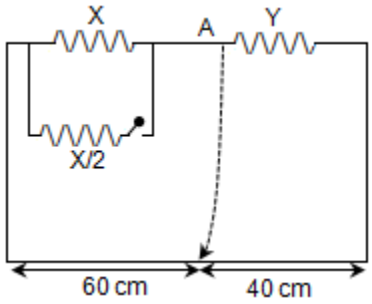
ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐

PAPER–I
PART I: PHYSICS
SECTION 1 (Maximum Marks: 32)

- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

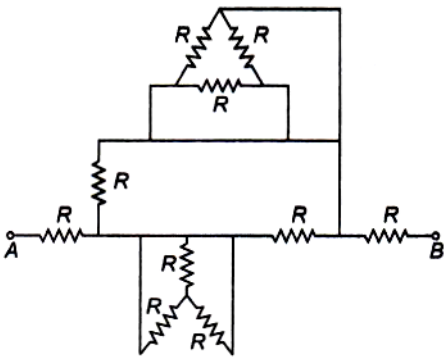
---

1. When two resistances X and Y are put in the left hand and right hand gaps in a meter bridge, the null point is at 60cm. If X is shunted by a resistance equal to half of itself then the shift in the null point is $\frac{20}{3}$x. find x.



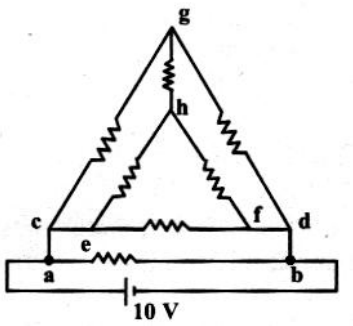
2. The current in a circuit containing a battery connected to 2Ω resistance is 0.9 A. When an additional resistance of 8Ω is connected to the same battery, the current observed in the circuit is 0.3A. Then the internal resistance of the battery is $x\Omega$. Find value of x.

3. Equivalent resistance between points A and B is 0.5 xR. Find value of x.



Space for rough work

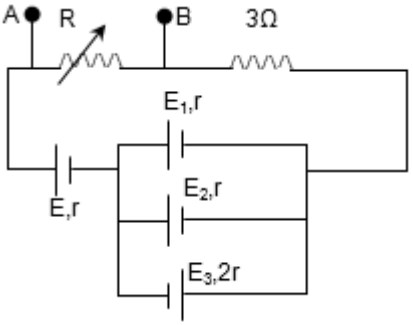
4. Consider the network shown in the figure. All resistance are equal to 2Ω. Find the potential difference between (in Volt) points e and h.



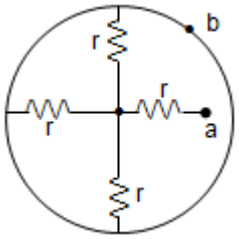
5. A rod has non-Ohmic behavior given by $I = 0.2\ V^{1/2}$, where V is the potential difference across it and I the current (both in SI units). The rod is connected in series with a Ohmic resistance (R) and a 6 V battery of negligible internal resistance. What is the value of resistance R such that the power dissipated in the rod is twice that dissipated in the resistor.

6. A 10 V car battery with negligible internal resistance is connected to a series combination of a 4Ω resistor that obeys Ohm's law and a thermistor that does not obey Ohm's law, but instead has a current –voltage relation $V = \alpha I + \beta I^2$ with $\alpha = 2\Omega$ and $\beta = 4\Omega/A$. The current through the 4Ω resistor is ?

7. Consider the electrical circuit shown. For R = 10 Ω power developed between A and B maximum. Find the value of r.



8. Find the equivalent resistances of the networks shown in figure between the points a and b if r = 3.

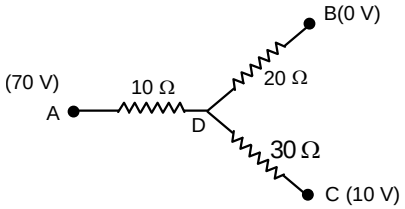


Space for rough work

SECTION 2 (Maximum Marks: 40)

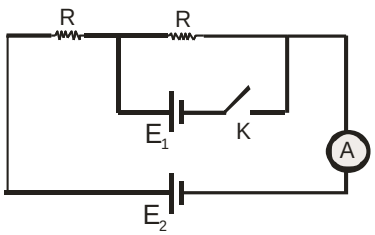
- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

9. In the network shown, points *A*, *B* and *C* are at potentials of 70 V, zero and 10 V respectively.



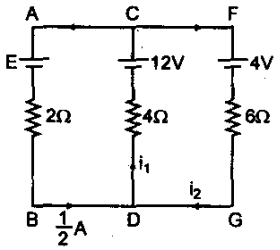
(A) Point *D* is at a potential of 40 V.
(B) The currents in the sections AD, DB, DC are in the ratio 3 : 2 : 1
(C) The currents in the sections AD, DB, DC are in the ratio 1 : 2 : 3
(D) The network draws a total power of 200 W

10. In the given circuit, when key K is open the reading of ammeter is I. Now key K is closed. Then the correct statement is (both the batteries have negligible resistance):



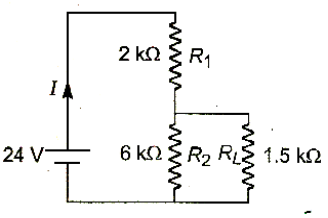
(A) If $E_1 = IR$, reading of the ammeter is I.
(B) If $IR < E_1 < 2IR$, reading of the ammeter is greater than I.
(C) If $E_1 = 2IR$, reading of the ammeter will be zero.
(D) Reading of the ammeter will not change.

11. In the circuit shown in figure:



(A) E =6.6V (B) i_i = 1.1 A
(C) i_2 = 0.5 A (D) E =4.4V

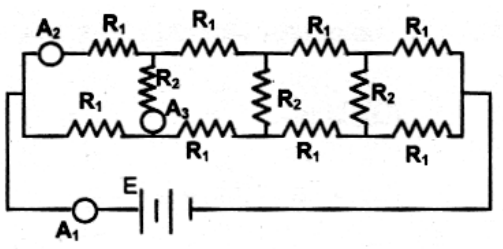
12. For the circuit shown in the figure



(A) the current I through the battery is 7.5 mA
(B) the potential difference across R_L is 18 V
(C) ratio of powers dissipated in R_1 and R_2 is 3
(D) if R_1 and R_2 are interchanged, magnitude of the power dissipated in R_L will decrease by a factor of 9

Space for rough work

13. In the given circuit, $R_1 = 10\Omega, R_2 = 6\Omega$ and $E = 10V$. Then, the correct statement(s) is /are.



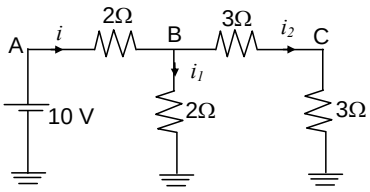
(A) Effective resistance of the circuit is 20Ω

(B) Reading of A_1 is 1/2 amp

(C) Reading of A_2 is 1/4 amp

(D) Reading of A_3 is 1/8 amp

14. In the circuit shown, the direction of current is shown in all the branches



(A) $i_2 = \frac{5}{7}$ A (B) $i_1 = \frac{1}{7}$ A

(C) $V_B = \frac{30}{7}$ volt (D) $V_C = \frac{10}{7}$ volt

15. When no current is passed through a conductor,

(A) the free electrons do not move

(B) the average speed of a free electron over a large period of time is zero

(C) the average velocity of a free electron over a large period of time is zero

(D) the average of the velocities of all the free electrons at an instant is zero

16. Two heaters designed for the same voltage V have different power ratings. When connected individually across a source of voltage V, they produce H amount of heat each in times t_1 and t_2 respectively. When used together across the same source, they produce H amount of heat in time t.

(A) If they are in series, $t = t_1 + t_2$ (B) If they are in series, $t = 2(t_1 + t_2)$

(C) If they are in parallel, $t = \frac{t_1 t_2}{(t_1 + t_2)}$ (D) If they are in parallel, $t = \frac{t_1 t_2}{2(t_1 + t_2)}$

17. A micrometer has a resistance of 100Ω and full scale range of 50 μA. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combination (s).

(A) 50 V range with $10k\Omega$ resistance in series (B) 10 V range with $200k\Omega$ resistance in series

(C) 5 mA range with 1Ω resistance in parallel (D) 10 mA range with 1Ω resistance in parallel

Space for rough work

18. A voltmeter and an ammeter are connected in series to an ideal cell of emf E. The voltmeter reading is V and the ammeter reading is I.
(A) V < E
(B) the voltmeter resistance is E/I.
(C) the potential difference across the ammeter is (E – V).
(D) Voltmeter resistance plus ammeter resistance = E/I.

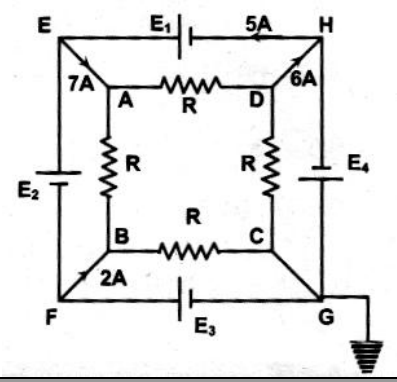
SECTION 3 (Maximum Marks: 16)

- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4×5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  +2 If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  0 If none of the bubbles is darkened.
  –1 In all other cases.

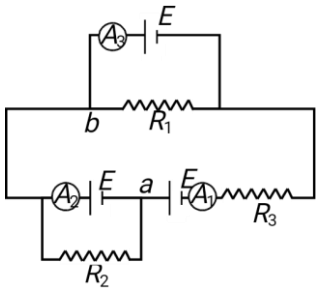
19. Figure shows an electric circuit contain four resistors of equal resistance 4Ω. Cells E_1, E_2, E_3 are ideal of unknown emf where as cell E_4 has some unknown internal resistance and emf 4V. It is found that current through EA, DH, FB and HE are 7A, 6A, 2A and 5A respectively. Then match the following



Column – I		Column – II	
(A)	Internal resistance of E_4 is	(p)	2
(B)	Current through DC is	(q)	5.5
(C)	Current through AD is	(r)	0.5
(D)	Emf of E_2 is	(s)	6

Space for rough work

20. In the circuit shown in figure, $R_1 = R_2 = R_3 = 3\Omega$ and e.m.f. of each cell is $E = 4V$ and negligible internal resistance. All ammeters are ideal. Match the following:



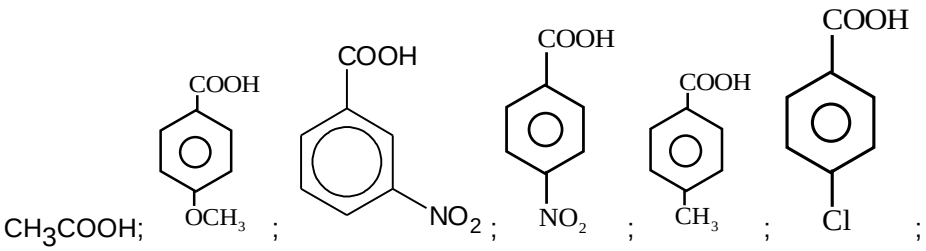
Column I		Column II
(A)	Reading of ammeter A_1 in ampere is	p. 4/3
(B)	Reading of ammeter A_2 in ampere is	q. 8/3
(C)	Reading of ammeter A_3 in ampere is	r. 4
(D)	Potential difference between point *a* and point *b* in volt is	s. zero t. 2

PART II: CHEMISTRY

SECTION 1 (Maximum Marks: 32)

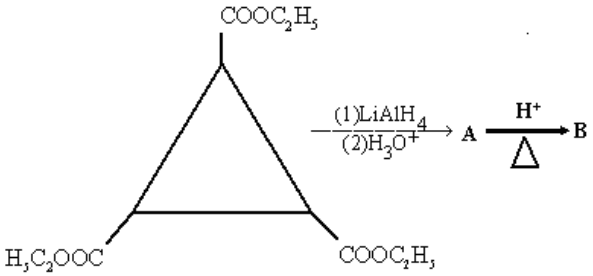
- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

21. The number of acids which are more acidic than benzoic acid.



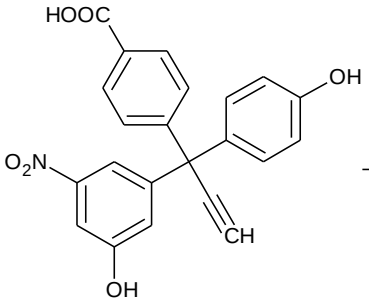
Space for rough work

22.



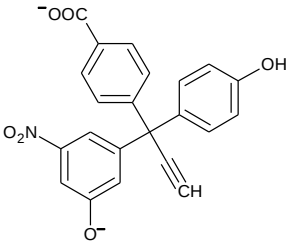
Number of hybrid orbitals on each carbon atom of in the ring of B are

23.

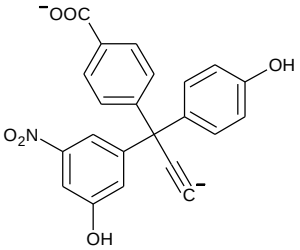


xNaNH$_2$ ⟶ The value of 'X will b

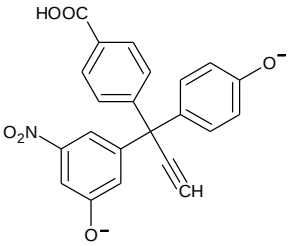
(A)



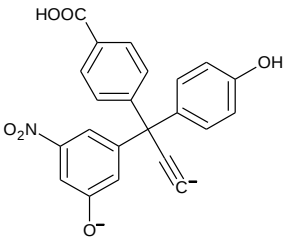
(B)



(C)



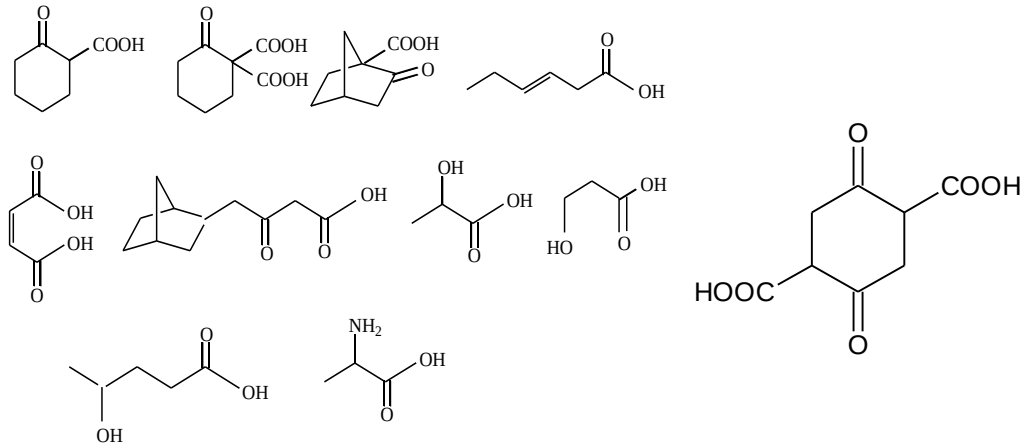
(D)



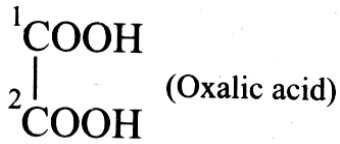
Space for rough work

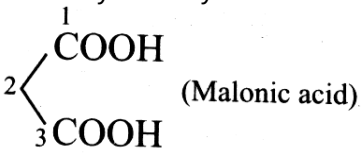
24. How many of the following reactions can takes place through nitrene intermediate ?
(1) Curtius reaction (2) Schmidt reaction
(3) Hoffmann–Bromamide reaction (4) Arndt–Eistert reaction

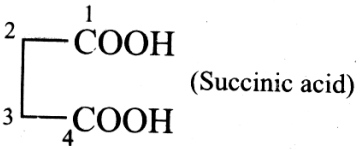
25. How many of the following compounds can undergo decarboxylation on strong heating.

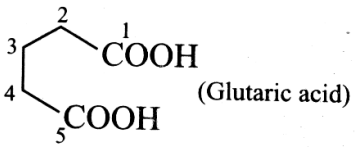


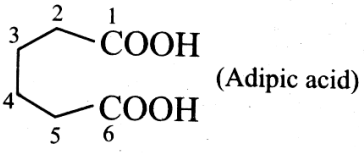
26. How many of the following dicarboxylic acids on heating forms stable cyclic anhydride

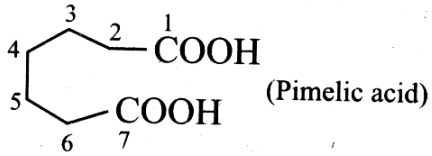
(A)  (Oxalic acid)

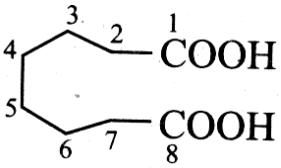
(B)  (Malonic acid)

(C)  (Succinic acid)

(D)  (Glutaric acid)

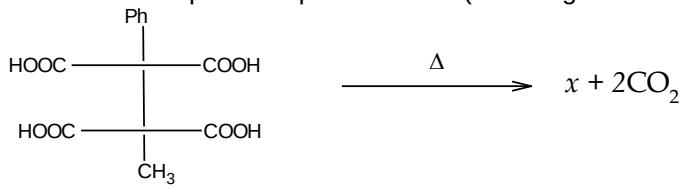
(E)  (Adipic acid)

(F)  (Pimelic acid)

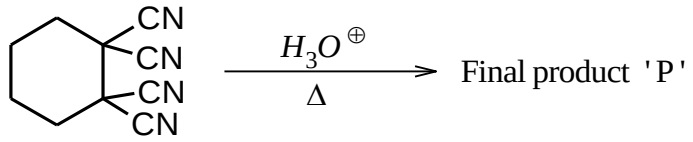
(G)  (Suberic acid)

Space for rough work

27. The number of products possible for x (including stereomers)in the following reaction is:



28.



Number of oxygen atoms in the final product P are

SECTION 2 (Maximum Marks: 40)

- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

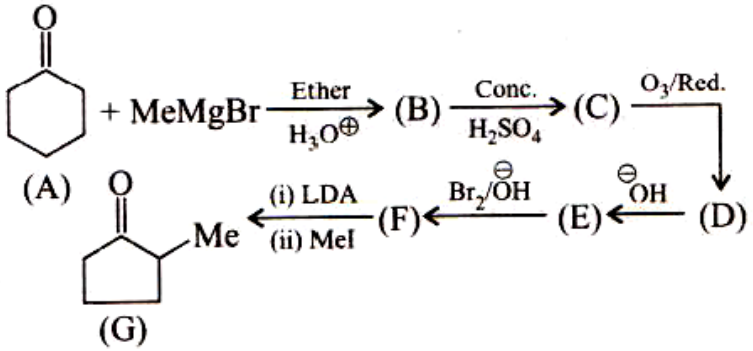
29. $MeCH_2CO_2H \xrightarrow[2)\ CH_2N_2\ 3)\ Ag_2O]{(1)\ SOCl_2} (B) \xrightarrow{H_2O} (C)$

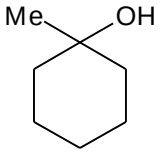
Which of the following statements are correct about the given reaction.
(A) B, C are Me–CH=C=O and $MeCH_2CO_2Me$
(B) B, C are $MeCH_2CH=C=O$ and $MeCH_2CH_2CO_2H$
(C) Wolff rearrangement reaction is involved
(D) Reaction is known as Arndt –Eistert homologation reaction.

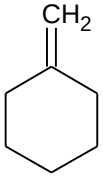
30. Which of the following compounds can reduce Tollen's agent?
(A) $HCOOH$ (B) CH_3COCH_2OH (C) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (D) CH_3CH_2CHO

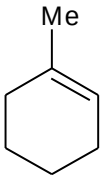
Space for rough work

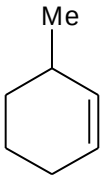
31. Compound (C) is :



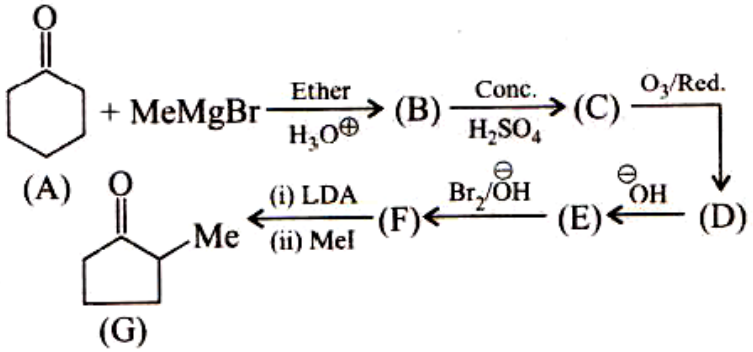
(A) 

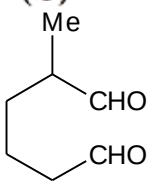
(B) 

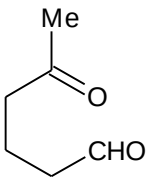
(C) 

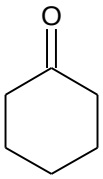
(D) 

32. Compound (D) is :



(A) 

(B) 

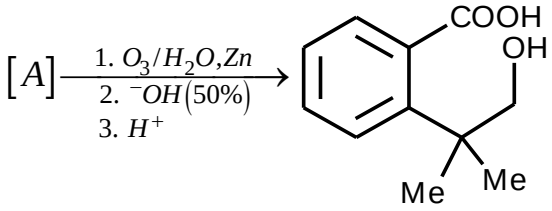
(C) 

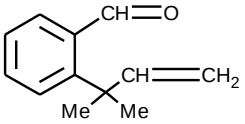
+ $CH_2 = O$

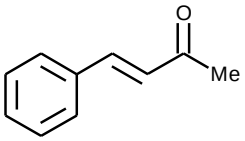
(D) Both (a) and (b)

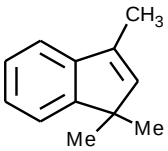
Space for rough work

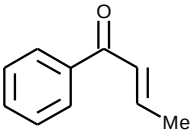
33. Which of the following is correct about (A) ?



(A) Compound A in above reaction is 

(B) Compound A in above reaction is 

(C) Compound A in above reaction is 

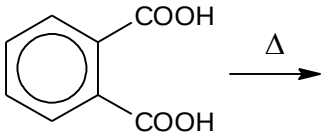
(D) Compound A in above reaction is 

34. Acid anhydride can be prepared by :

(A) $C_6H_5COOH + CH_3COCl \xrightarrow{\text{Pyridine}}$

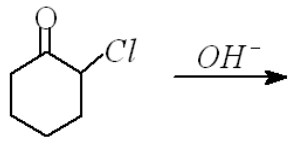
(B) $C_6H_5COO^{(-)}Na^{(+)} + C_6H_5COCl \longrightarrow$

(C) $C_6H_5CONH + CH_3COO^{(-)}Na^{(+)} \longrightarrow$

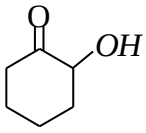
(D) 

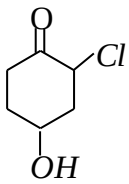
Space for rough work

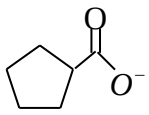
35

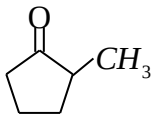


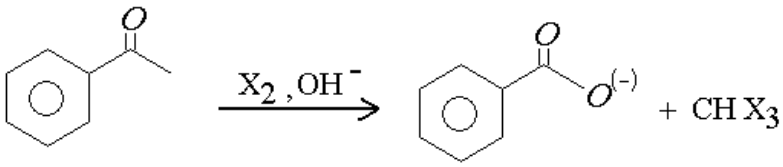
X. Find the product 'X'

(A) 

(B) 

(C) 

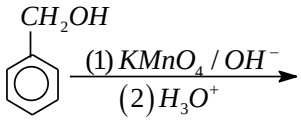
(D) 

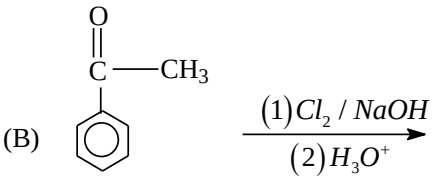
36. 

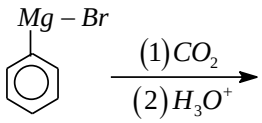
Which of the following is correct comparison of rate of haloform reaction with various halogens?

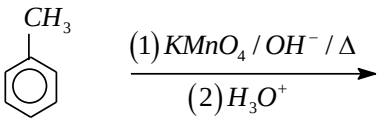
(A) $r_{Cl_2} > r_{Br_2} > r_{I_2}$ (B) $r_{I_2} > r_{Br_2} > r_{Cl_2}$ (C) $r_{Br_2} > r_{Cl_2} > r_{I_2}$ (D) $r_{Cl_2} \approx r_{Br_2} \approx r_{I_2}$

37. In which of the following reactions benzoic acid is the product?

(A) 

(B) 

(C) 

(D) 

38. The rearrangements in which the alkyl isocyanate (RNCO) is formed as an intermediate is are
(A) Hoffmann-bromamide reaction (B) Schmidt reaction (C) Curtius reaction (D) Lossen reaction

Space for rough work

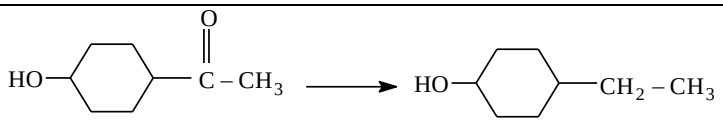
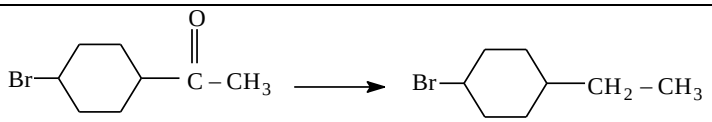
SECTION 3 (Maximum Marks: 16)

- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4 × 5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

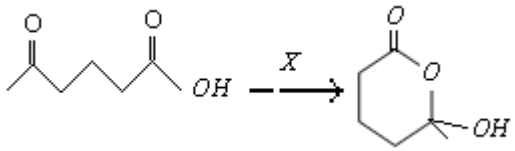
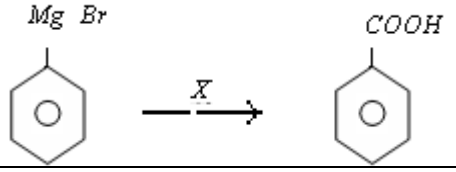
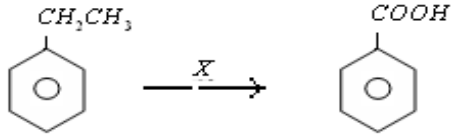
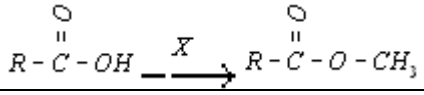
- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  - **+2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–1** In all other cases.

39.

Column – I		Column – II	
(A)	$R-X \rightarrow R-H$	(p)	$Zn-Hg$ / conc.HCl
(B)		(q)	CH_3Li
(C)		(r)	Bu_3SnH
(D)	$RCOOH \rightarrow RCOCH_3$	(s)	$NH_2-NH_2 / \overset{\ominus}{O}H$

Space for rough work

40.

Column – I		Column – II	
(A)		(p)	CO_2 / H_2O
(B)		(q)	CH_2N_2
(C)		(r)	$NaBH_4 / H_2O$
(D)		(s)	$KMnO_4 / OH^-$

Space for rough work

PART III: MATHEMATICS

SECTION 1 (Maximum Marks: 32)

- This section contains **EIGHT** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- Marking scheme:
  - **+4** If the bubble corresponding to the answer is darkened.
  - **0** In all other cases.

41. If the point P(4, –2) is one end of the focal chord PQ of $y^2 = x$, then the slope of the tangent at Q is

42. Consider the locus of centre of the circle which touches the circle $x^2 + y^2 = 4$ and the line $x = 4$. The distance of the vertex of the locus from the origin is

43. If on a given base BC [B(0, 0) and C(2, 0)], a triangle described such that the sum of the tangents of the base angles is 4, then the equation of the locus of the opposite vertex A is a parabola whose directrix is $y = k$. The value of $8k – 9$ is

44. If the circle $(x – 6)^2 + y^2 = r^2$ and the parabola $y^2 = 4x$ have maximum number of common chords, then the least integral value of r is

45. If the length of the latus rectum of the parabola $169\{(x – 1)^2 + (y – 3)^2\} = (5x – 12y + 17)^2$ is L, then the value of $\frac{13L}{4}$ is

46. $y = x + 2$ is any tangent to the parabola $y^2 = 8x$. The ordinate of the point P on this tangent such that the other tangent from it which is perpendicular to it is

47. The focal chord of $y^2 = 16x$ is tangent to $(x – 6)^2 + y^2 = 2$. Then the possible value of the square of slope of this chord is

48. The equation of the line touching both the parabolas $y^2 = 4x$ and $x^2 = –32y$ is $ax + by + c = 0$. Then the value of $a + b + c$ is

Space for rough work

SECTION 2 (Maximum Marks: 40)

- This section contains **TEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- Marking scheme:
  - **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–2** In all other cases

49. The parabola $y^2 = 4x$ and the circle having its centre at (6, 5) intersect at right angle. The possible point of intersection of these curves can be
(A) (9, 6) (B) $\left(2,\sqrt{8}\right)$ (C) (4, 4) (D) $\left(3,2\sqrt{3}\right)$

50. A quadrilateral is inscribed in a parabola. Then
(A) the quadrilateral may be cyclic
(B) diagonals of the quadrilateral may be equal
(C) all possible pairs of adjacent sides may be perpendicular
(D) none of these

51. The locus of the midpoint of the focal distance of a variable point moving on the parabola $y^2 = 4ax$ is 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 coordinates (a, 0)

52. Which of the following line can be tangent to the parabola $y^2 = 8x$?
(A) $x – y + 2 = 0$ (B) $9x – 3y + 2 = 0$ (C) $x + 2y + 8 = 0$ (D) $x + 3y + 12 = 0$

53. If two distinct chords of a parabola $y^2 = 4ax$ passing through (a, 2a) are bisected on the line $x + y = 1$, then the length of the latus rectum can be
(A) 2 (B) 1 (C) 4 (D) 3

54. The equations of the directrix of the parabola with vertex at the origin and having the axis along the x-axis and a common tangent of slope 2 with the circle $x^2 + y^2 = 5$ is (are)
(A) $x = 10$ (B) $x = 20$ (C) $x = –10$ (D) $x = –20$

Space for rough work

55. Tangent is drawn at any point (x_1, y_1) other than the vertex on the parabola $y^2 = 4ax$. If tangents are drawn from any point on this tangent to the circle $x^2 + y^2 = a^2$ such that all the chords of contact pass through a fixed point (x_2, y_2) then

(A) x_1, a, x_2 are in GP (B) $\frac{y_1}{2}$, a, y_2 are in GP (C) $-4, \frac{y_1}{y_2}, \frac{x_1}{x_2}$ are in GP (D) $x_1x_2 + y_1y_2 = a^2$

56. If the focus of the parabola $x^2 - ky + 3 = 0$ is (0, 2), then a value of k is (are)
(A) 4 (B) 6 (C) 3 (D) 2

57. Let P be a point whose coordinates differ by unity and the point does not lie on any of the axes of reference. If the parabola $y^2 = 4x + 1$ passes through P, then the ordinate of P may be
(A) 3 (B) –1 (C) 5 (D) 1

58. If y = 2 is the directrix and (0, 1) is the vertex of the parabola $x^2 + \lambda y + \mu = 0$, then
(A) $\lambda = 4$ (B) $\mu = 8$ (C) $\lambda = -8$ (D) $\mu = 4$

SECTION 3 (Maximum Marks: 16)

- This section contains **TWO** questions.
- Each question contains two columns, **Column I** and **Column II**
- **Column I** has **four** entries (A), (B), (C) and (D)
- **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- Match the entries in **Column I** with the entries in **Column II**
- One or more entries in **Column I** may match with one or more entries in **Column II**.
- The ORS contains a 4×5 matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- Marking entry in Column I.
  - **+2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - **0** If none of the bubbles is darkened.
  - **–1** In all other cases.

Space for rough work

59. Match the following

Column I		Column II	
(A)	Tangents are drawn from point (2, 3) to the parabola $y^2 = 4x$. Then the points of contact are	p.	(9, –6)
(B)	From a point P on the circle $x^2 + y^2 = 5$, the equation of chord of contact to the parabola $y^2 = 4x$ is $y = 2(x – 2)$. Then the coordinate of point P will be	q.	(1, 2)
(C)	P(4, –4) and Q are points on the parabola $y^2 = 4x$ such that the area of ΔPOQ is 6 sq. units, where O is the vertex. Then the coordinates of Q may be	r.	(–2, 1)
(D)	The common chord of the circle $x^2 + y^2 = 5$ and the parabola $6y = 5x^2 + 7x$ will pass through points (s)	s.	(4, 4)

60. Consider the parabola $(x – 1)^2 + (y – 2)^2 = \dfrac{(12x – 5y + 3)^2}{169}$

Column I		Column II	
(A)	Locus of point of intersection of perpendicular tangent	p.	$12x – 5y – 2 = 0$
(B)	Locus of foot of perpendicular from focus upon any tangent	q.	$5x + 12y – 29 = 0$
(C)	Line along which minimum length of focal chord occurs	r.	$12x – 5y + 3 = 0$
(D)	Line about which parabola is symmetrical	s.	$24x – 10y + 1 = 0$

pace for rough work

FIITJEE RET – 5

(2017 – 2019)(2ND YEAR_REGULAR)

IIT-2015 (P1)_SET–B

DATE: 23.07.2018

ANSWERS

PHYSICS

1.	**4**	2.	**2**	3.	**5**	4.	**5**
5.	**5**	6.	**1**	7.	**5**	8.	**4**
9.	**A,B,D**	10.	**A,C**	11.	**A,B**	12.	**A,D**
13.	**A,B,C**	14.	**A,C**	15.	**C,D**	16.	**A,C**
17.	**B,C**	18.	**A,C,D**	19.	**A – p; B – r; C – q; D – s**		
20.	**A – p; B – q; C – s; D – r**						

CHEMISTRY

21.	**3**	22.	**3**	23.	**4**	24.	**3**
25.	**5**	26.	**2**	27.	**4**	28.	**3**
29.	**B, C, D**	30.	**A, B, D**	31.	**C**	32.	**B**
33.	**A**	34.	**A, B, D**	35.	**C**	36.	**D**
37.	**A, B, C, D**	38.	**A, B, C, D**	39.	**A → r; B → s; C → p; D → q**		
40.	**A → r; B → p; C → s; D → q**						

MATHEMATICS

41.	**4**	42.	**3**	43.	**8**	44.	**5**
45.	**7**	46.	**0**	47.	**1**	48.	**3**
49.	**AC**	50.	**AB**	51.	**ABCD**	52.	**ABC**
53.	**ABD**	54.	**AC**	55.	**BCD**	56.	**BD**
57.	**AC**	58.	**AD**	59.	**A → q, s; B → r; C → p, q; D → q, r**		
60.	**A → r; B → s; C → p; D → q**						