

FIITJEE RET – 7

(2018 – 2020)(1ST YEAR_REGULAR)

IIT-2015 (P2)_SET-A

DATE: 30.07.2018

Time: 3 hours

Maximum Marks: 240

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 **8 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 paragraphs** type questions. Each paragraph describes an experiment, a situation or a problem. Two multiple choice questions will be asked based on this paragraph. One or more than one option can be correct.

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 **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.

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.

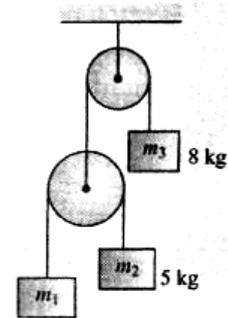
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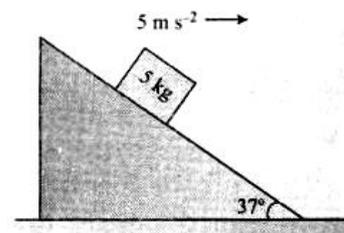
PAPER – II
PART I: PHYSICS
SECTION 1 (Maximum Marks: 32)

- ◆ 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:**
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 - 0** In all other cases

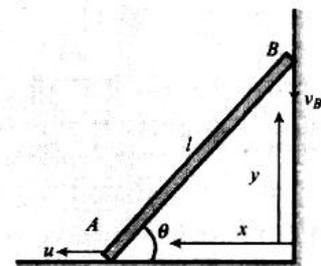
1. Three blocks m_1, m_2 and m_3 are arranged as shown in fig. ($m_2 = 5\text{kg}$ and $m_3 = 8\text{kg}$). If m_1 is the mass in kg for which 8kg block remains at rest when the system is released then $\frac{3m_1}{2}$ is _____



2. An inclined plane is moved toward right with an acceleration of 5 m s^{-2} as shown in fig. If F_0 is the force in Newton which block of mass 5 kg exerts on the incline plane. (All surface are smooth) then $\left(\frac{F_0}{5} - 2\right)$ is _____

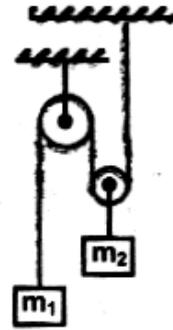


3. Fig Shows a rod of length ℓ resting on a wall and the floor. Its lower end A is pulled towards left with a constant velocity $u = 1\text{ m/s}$. As a result of this, end B starts moving down along the wall. If V_B is the velocity of the other end B downward in m/s when the rod makes an angle $\theta = 30^\circ$ with the horizontal. Then value of $2V_B^2$ is _____

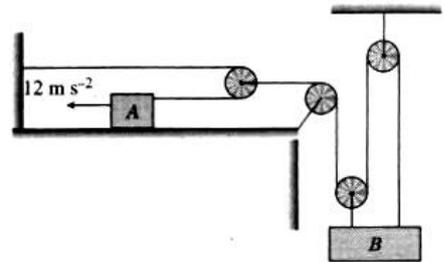


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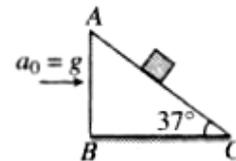
4. Two blocks of masses m_1 and m_2 are connected by inextensible massless strings as shown in the figure. Neglecting the masses of pulleys and assuming friction at any point of the system to be absent, the ratio of $\frac{m_1}{m_2}$ for equilibrium of the system is $\alpha : \beta$. Find $\alpha^2 + \beta^2$



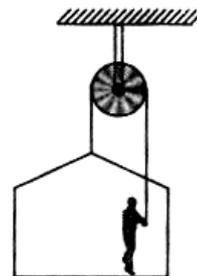
5. Block A is given an acceleration 12 ms^{-2} towards left as shown in fig. Assuming block B always remains horizontal, find the acceleration (in ms^{-2}) of B



6. A block is placed on an inclined plane moving towards right horizontally with an acceleration $a_0 = g$. The length of the plane $AC = 1\text{m}$. Friction is absent everywhere. Find the time taken (in seconds) by the block to reach from C to A.

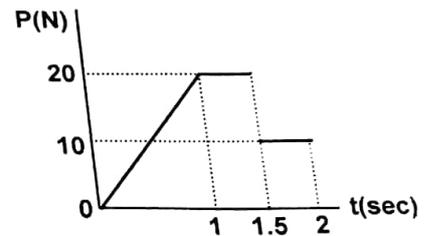


7. A man is raising himself and the crate on which he stands with an acceleration of 5 ms^{-2} by a massless rope – and – pulley arrangement. Mass of the man is 100 kg and that of the crate is 50kg . If tension in the rope is ' 125α ' Newton then α is _____
Take $g = 10 \text{ m/s}^2$



Space for rough work

8. A body of mass 6.25 kg is traveling in a horizontal straight line with a velocity of 3 m/sec when a horizontal force p is applied to it at right angle to the initial direction of motion. If P varies according to the accompanying graph, remains constant in direction and is the only force acting on the body in its plane of motion, find the magnitude of the velocity of the body when $t = 2$ sec

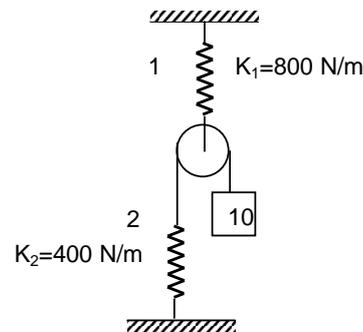


SECTION 2 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** 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

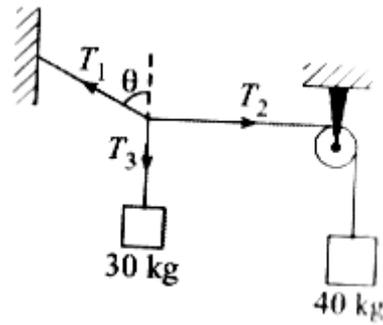
9. A reference frame attached to the earth
- (A) Is the inertial frame as motion of earth is at uniform speed
- (B) Cannot be the inertial frame because earth is revolving around the sun
- (C) Is an inertial frame because Newton's Laws are applicable in this frame
- (D) Cannot be the inertial frame because earth is rotating about its own axis

10. A block of 10 kg is hanging with the help of a pulley and two springs, as shown. The system is at equilibrium and x_1 and x_2 are the elongation in the spring 1 and 2 respectively ($g = 10 \text{ m/s}^2$) Then.
- (A) Elongation in both the springs will be different because spring constant is different
- (B) $x_2 = 0.5 \text{ m}$
- (C) $x_1 = 0.25 \text{ m}$
- (D) $x_2 = 0.25 \text{ m}$



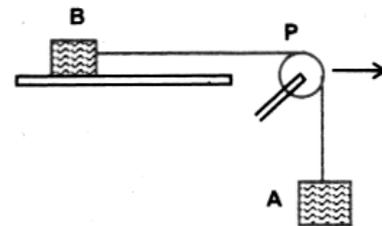
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11. In the arrangement shown in the figure if system is in equilibrium ($g = 10 \text{ m/s}^2$)
- (A) Tension $T_1 = 50 \text{ N}$
 (B) Tension $T_1 = 500 \text{ N}$
 (C) Angle $\theta = 37^\circ$
 (D) Angle $\theta = 53^\circ$



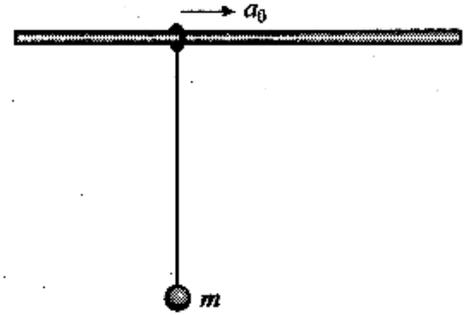
12. A block of weight 9.8 N is placed on a table. The smooth table surface exerts an upward force of 10 N on the block. Assume $g = 9.8 \text{ m/s}^2$
- (A) The block exerts a force of 10 N on the table
 (B) The block exerts a force of 19.8 N on the table
 (C) The block exerts a force of 9.8 N on the table
 (D) The block has an upward acceleration

13. In the figure, the pulley P moves to the right with a constant speed u . The downward speed of the block A is V_A , and the speed of the block B to the right is V_B . Then
- (A) $V_B = V_A$
 (B) $V_B = u + V_A$
 (C) $V_B + u = V_A$
 (D) the two blocks have accelerations of the same magnitude.

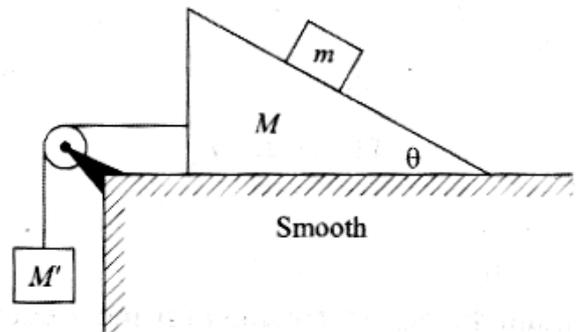


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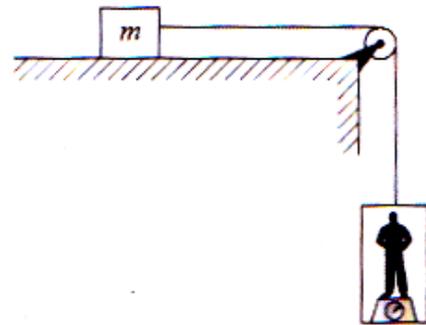
14. The ring shown in the figure is given a constant horizontal acceleration ($a_0 = g/\sqrt{3}$). Maximum deflection of the string from the vertical is θ_0 , then.
- (A) $\theta_0 = 30^\circ$
 (B) $\theta_0 = 60^\circ$
 (C) at maximum deflection, tension in string is equal to mg
 (D) at maximum deflection, tension in string is equal to $\frac{2mg}{\sqrt{3}}$



15. The figure shows a block of mass m placed on a smooth wedge of mass M . Calculate the value of M' and tension in the string, so that the block of mass m will move vertically downward with accelerating g (Take $g = 10 \text{ m/s}^2$)
- (A) The value of M' is $\frac{M \cot \theta}{1 - \cot \theta}$
 (B) the value M' is $\frac{M \cot \theta}{1 - \tan \theta}$
 (C) The value of tension in the string is $Mg \cot \theta$
 (D) the value of tension is $Mg \tan \theta$



16. In the figure, a man of true mass M is standing on a weighing machine placed in a cabin. The cabin is joined by a string with a body of mass m . Assuming no friction, and negligible mass of cabin and weighing machine, the measured mass of man is : (normal force between the man and the machine is proportional to the mass)
- (A) Measured mass of man is $\frac{Mm}{(M+m)}$
 (B) Acceleration of man is $\frac{mg}{(M+m)}$
 (C) Acceleration of man is $\frac{Mg}{(M+m)}$
 (D) Measured mass of man is M



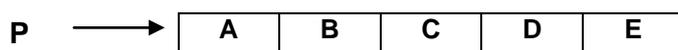
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SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** paragraphs
- ◆ Based on each paragraph, there will be **TWO** questions
- ◆ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
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Paragraph-1

Five identical cubes each of mass ' m ' are on a straight line with two adjacent faces in contact on horizontal surface as shown in figure. Suppose the surface is frictionless and a constant force P is applied from left to right to the end face of A, which of the following statement are correct

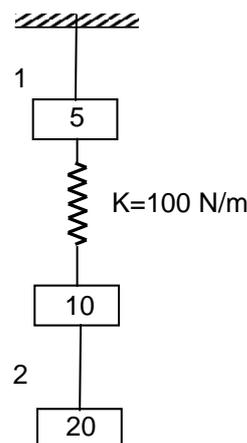


17. The acceleration of cube D is
- (A) $\frac{5P}{m}$ (B) $\frac{P}{5m}$ (C) $\frac{P}{m}$ (D) None
18. Force exerted by C on D is
- (A) P (B) $\frac{P}{5}$ (C) $\frac{3P}{5}$ (D) None

Space for rough work

Paragraph-2

In the figure given below. The system comprises of 3 blocks of 5kg , 10 kg and 20 kg, along with string 1, string 2 and a spring of spring constant 100 N/m(The system is initially at equilibrium)



19. When the spring is cut, tension in string 1 and string 2, just after cutting, are respectively.
 (A) 350 N, 200 N (B) 50 N, 0 N
 (C) 50 N, 200 N (D) None of these
20. When string 2 is cut, tension in the string 1 and spring force values are respectively ?
 (A) 350 N, 300 N (B) 150 N, 300 N
 (C) 150 N, 100 N (D) None of these

PART II: CHEMISTRY

SECTION 1 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** questions
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21. Among the following, the number of elements showing only one non-zero oxidation state is O, Cl, N, P, Na, H, C, Fe
22. The difference in the oxidation numbers of the two types of sulphur atoms in $\text{Na}_2\text{S}_4\text{O}_6$ is

Space for rough work

30. In which of the following cases, oxidation state of oxygen atom changes
(A) $\text{HSO}_4^- \rightarrow \text{H}_2\text{S}_2\text{O}_8$ (B) $\text{CrO}_4^{2-} \rightarrow \text{CrO}_5$ (C) $\text{SO}_3^{2-} \rightarrow \text{SO}_4^{2-}$ (D) $\text{OH}^- \rightarrow \text{H}_2\text{O}$
31. Which of the following molecules have equal number of atoms ?
(A) 12g of MgSO_4 (B) 50 ml of 0.0133 M $\text{C}_2\text{H}_5\text{OH}$
(C) 0.12 gram molecule of Fe_2O_3 (D) 4.48 L of SO_2 gas at NTP.
32. 500 ml of 0.2 M NaOH solution concentration changes to 0.4 M by
(A) Removing 250 ml of H_2O (B) Removing 500 ml of H_2O
(C) adding 8g of NaOH (D) adding 4g of NaOH
33. Which of the following statements is/are correct ?
(A) Molality is temperature dependent
(B) Mole fraction is independent of temperature
(C) Molarity means number of moles of solute in 1000g of solvent.
(D) Mole fraction has no unit.
34. 1 mole of H_2SO_4 present in solution is exactly neutralized by
(A) 1 mole of NaOH (B) 2 mole of $\text{Ca}(\text{OH})_2$ (C) 1 mole of $\text{Ba}(\text{OH})_2$ (D) 1 mole of $\text{Ca}(\text{OH})_2$
35. 100 gms of CaCO_3 reacts with 100 ml of 1 M HCl. The weight of CaCO_3 unreacted & moles of CaCl_2 formed.
(A) 95 gms of CaCO_3 (B) 0.05 moles of CaCl_2 (C) 0.1 moles of CaCl_2 (D) 5 gms of CaCO_3
36. A sample of H_2SO_4 (density 1.8 g mL^{-1}) is 90% by weight what is the volume of the acid that has to be used to make 1 L of 0.2 M H_2SO_4 ?
(A) 16 mL (B) 18 mL (C) 12 mL (D) 10 mL

Space for rough work

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Paragraph-1

Isotopes are the atoms of same element; they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus. If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio $m : n$, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. The elements which have single isotope are called monoisotopic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

37. The isotopes of chlorine with mass number 35 and 37 exist in the ratio of Its average atomic mass is 35.5.
 (A) 1 : 1 (B) 2 : 1 (C) 3 : 1 (D) 3 : 2
38. Atomic mass of boron is 10.81. It has two isotopes namely ${}^{11}_5\text{B}$ and ${}^x_5\text{B}$ with their relative abundance of 80% and 20% respectively. The value of x is
 (A) 10 (B) 9 (C) 12 (D) 13

Paragraph-2

36.5% (w/w) HCl has density equal to 1.20 gmL^{-1}

39. Molarity of the solution
 (A) 10 (B) 12 (C) 14 (D) 16
40. Molality of the solution
 (A) 13 (B) 15.7 (C) 16 (D) 10

Space for rough work

PART III: MATHEMATICS
SECTION 1 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** questions
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◆ **Marking scheme:**

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0 In all other cases

41. If the line $y - x - 1 + \lambda = 0$ is equidistant from the points $(1, -2)$ and $(3, 4)$, then λ is
42. Integral value of λ for which the points $(\lambda + 1, 1)$, $(2\lambda + 1, 3)$, $(2\lambda + 2, 2\lambda)$ are collinear is
43. Number of integral values of m , for which the x -coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is
44. If the image of the point $(4, -13)$ in the line $5x + y + 6 = 0$ is of the form $(-1, -2k)$, then the value of $|k|$ is
45. The number of values of k for which the line $(k + 1)x + 8y = 4k$ and $kx + (k + 3)y = 3k - 1$ are coincident is
46. The sides of a triangle ABC lie on the lines $3x + 4y = 0$, $4x + 3y = 0$ and $x = 3$. Let (h, k) be the centre of the circle inscribed in $\triangle ABC$. The value of $(h + k)$ equals
47. The line $3x + 2y = 24$ meets the y -axis at A and the x -axis at B . The perpendicular bisector of AB meets the line through $(0, -1)$ parallel to the x -axis at C . If the area of triangle ABC is A , then the value of $\frac{A}{13}$ is
48. The vertices of a triangle are $A(-1, -7)$, $B(5, 1)$ and $C(1, 4)$. If the internal angular bisector of $\angle B$ meets the side AC in D , then the length AD is $\frac{2\sqrt{2}k}{3}$, then the value of k is

Space for rough work

SECTION 2 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** questions
- ◆ Each question has FOUR options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
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49. Let $O \equiv (0, 0)$, $A \equiv (0, 4)$, $B \equiv (6, 0)$. Let P be a moving point such that the area of triangle POA is two times the area of triangle POB. The locus of P will be a straight line whose equation can be
 (A) $x + 3y = 0$ (B) $x + 2y = 0$ (C) $2x - 3y = 0$ (D) $3y - x = 0$
50. The point $(a^2, a + 1)$ lies in the angle between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin if
 (A) $a \in (-3, 0)$ (B) $a \in \left(\frac{1}{3}, 1\right)$
 (C) $a \in \left(-3, \frac{1}{3}\right)$ (D) $a \in \left(\frac{1}{3}, \infty\right)$
51. ABC is an isosceles triangle. If the coordinates of the base are B(1, 3) and C(-2, 7), the coordinates of vertex A can be
 (A) $\left(6, \frac{5}{6}\right)$ (B) $\left(\frac{5}{6}, 6\right)$ (C) $\left(-7, \frac{1}{8}\right)$
 (D) any point on the line $6x + 8y + 43 = 0$
52. Angles made with the x-axis by two lines drawn through the point (1, 2) cutting the line $x + y = 4$ at a distance $\frac{\sqrt{6}}{3}$ from the point (1, 2) are
 (A) $\frac{\pi}{12}$ and $\frac{5\pi}{12}$ (B) $\frac{\pi}{8}$ and $\frac{3\pi}{8}$ (C) $-\frac{7\pi}{12}$ and $-\frac{11\pi}{12}$ (D) none of these

Space for rough work

53. A(1, 3) and C(7, 5) are two opposite vertices of a square. The equation of a side through A is
 (A) $x + 2y - 7 = 0$ (B) $x - 2y + 5 = 0$ (C) $2x - y + 1 = 0$ (D) none of these
54. The straight line L is perpendicular to the line $5x - y = 1$. The area of the triangle formed by the line L and the coordinate axes is 5, then the equation of the line is
 (A) $x - 5y = 5\sqrt{2}$ (B) $x + 5y = 5\sqrt{2}$ (C) $x + 5y = -5\sqrt{2}$ (D) none of these
55. The points (1, 3) and (5, 1) are the opposite vertices of a rectangle. The other two vertices lie on the line $y = 2x + c$, then the remaining vertices are
 (A) (2, 0) (B) (4, 4) (C) (-2, 0) (D) none of these
56. Two sides of a rhombus OABC (lying entirely in first quadrant or fourth quadrant) of area equal to 2sq. units , are $y = \frac{x}{\sqrt{3}}$, $y = \sqrt{3}x$. Then possible coordinates of B is /are ('O' being the origin)
 (A) $(1 + \sqrt{3}, 1 + \sqrt{3})$ (B) $(-1 - \sqrt{3}, -1 - \sqrt{3})$ (C) $(\sqrt{3} - 1, \sqrt{3} - 1)$ (D) none of these

SECTION 3 (Maximum Marks: 16)

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Space for rough work

Paragraph-1

Equation of the line having slope 'm' and y intercept 'c' is $y = mx + c$. Equation of the line passing through (x_1, y_1) and having inclination ' θ ' with x-axis is $\frac{x - x_1}{\cos \theta} = \frac{y - y_1}{\sin \theta} = \pm r$ where $\theta \neq \frac{n\pi}{2}$ and 'r' is the distance of (x_1, y_1) from (x, y) along the line.

57. In a $\triangle ABC$, co-ordinates of A are (1, 2) and the equations of the medians through B and C are $x + y = 5$ and $x = 4$ respectively then $AB^2 - AC^2$ is
 (A) 25 (B) 37 (C) 12 (D) 21
58. A(1, 1); B(4, -2); C(5, 5) are vertices of a triangle ABC then the equation of the perpendicular dropped from C to internal angular bisector of A is
 (A) $x + y = 1$ (B) $y - 7 = 0$ (C) $x - 5 = 0$ (D) $2x + y = 0$

Paragraph-2

The vertex A of triangle ABC is (3, -1). The equations of median BE and angular bisector CF are $6x + 10y - 59 = 0$ and $x - 4y + 10 = 0$ respectively. Then

59. Slope of the side BC must be
 (A) $\frac{1}{9}$ (B) $-\frac{2}{9}$ (C) $\frac{1}{7}$ (D) none of these
60. The equation of AB must be
 (A) $x + y = 2$ (B) $x + 4y = 0$ (C) $18x + 13y = 41$ (D) $23x - y = 70$

Space for rough work

FIITJEE RET – 7

(2018 – 2020)(1ST YEAR_REGULAR)

IIT-2015 (P2)_SET-A

DATE: 30.07.2018

ANSWERS

PHYSICS

1. 5	2. 9	3. 6	4. 5
5. 2	6. 1	7. 9	8. 5
9. B,D	10. C,D	11. B,D	12. A,D
13. B,D	14. B,C	15. A,C	16. A,C
17. B	18. D	19. B	20. A

CHEMISTRY

21. 1	22. 5	23. 5	24. 9
25. 1	26. 9	27. 2	28. 4
29. B, D	30. A, B,	31. A, C, D	32. A, D
33. B, D	34. C, D	35. A, B	36. C
37. C	38. A	39. B	40. B

MATHEMATICS

41. 2	42. 2	43. 2	44. 7
45. 1	46. 0	47. 7	48. Bonus
49. AD	50. AB	51. BC	52. AC
53. AC	54. BC	55. AB	56. A
57. Bonus	58. C	59. B	60. C

FIITJEE RET – 7

(2018 – 2020)(1ST YEAR_REGULAR)

IIT-2015 (P2)_SET-B

DATE: 30.07.2018

Time: 3 hours

Maximum Marks: 240

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 **8 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 paragraphs** type questions. Each paragraph describes an experiment, a situation or a problem. Two multiple choice questions will be asked based on this paragraph. One or more than one option can be correct.

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 **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.

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.

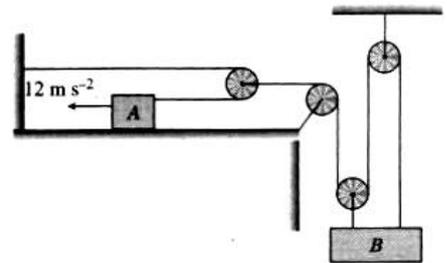
NAME:

ENROLLMENT NO.:

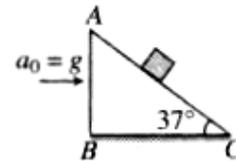
PAPER – II
PART I: PHYSICS
SECTION 1 (Maximum Marks: 32)

- ◆ 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

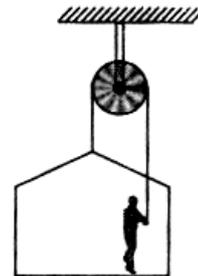
1. Block A is given an acceleration 12 ms^{-2} towards left as shown in fig. Assuming block B always remains horizontal, find the acceleration (in ms^{-2}) of B



2. A block is placed on an inclined plane moving towards right horizontally with an acceleration $a_0 = g$. The length of the plane $AC = 1\text{m}$. Friction is absent everywhere. Find the time taken (in seconds) by the block to reach from C to A.

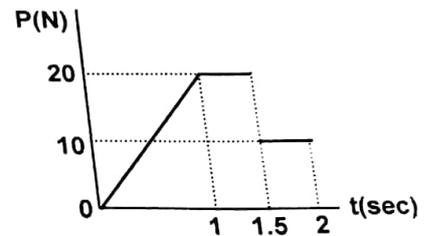


3. A man is raising himself and the crate on which he stands with an acceleration of 5 ms^{-2} by a massless rope – and – pulley arrangement. Mass of the man is 100 kg and that of the crate is 50kg . If tension in the rope is ' 125α ' Newton then α is _____
 Take $g = 10 \text{ m/s}^2$

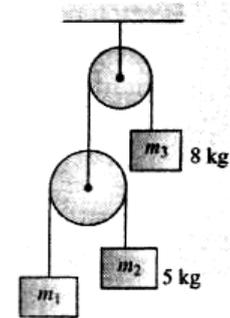


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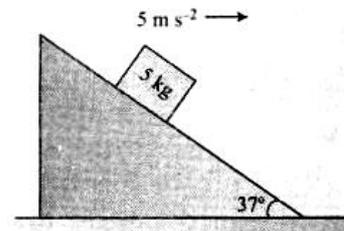
4. A body of mass 6.25 kg is traveling in a horizontal straight line with a velocity of 3 m/sec when a horizontal force p is applied to it at right angle to the initial direction of motion. If P varies according to the accompanying graph, remains constant in direction and is the only force acting on the body in its plane of motion, find the magnitude of the velocity of the body when $t = 2$ sec



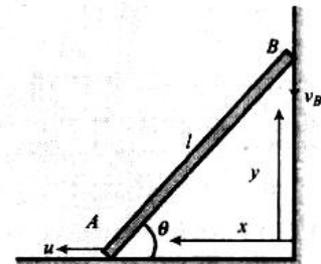
5. Three blocks m_1, m_2 and m_3 are arranged as shown in fig. ($m_2 = 5\text{kg}$ and $m_3 = 8\text{kg}$). If m_1 is the mass in kg for which 8kg block remains at rest when the system is released then $\frac{3m_1}{2}$ is _____



6. An inclined plane is moved toward right with an acceleration of 5 ms^{-2} as shown in fig. If F_0 is the force in Newton which block of mass 5 kg exerts on the incline plane. (All surface are smooth) then $\left(\frac{F_0}{5} - 2\right)$ is _____

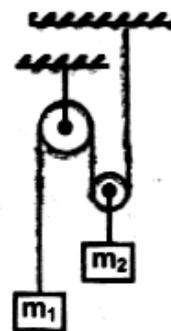


7. Fig Shows a rod of length ℓ resting on a wall and the floor. Its lower end A is pulled towards left with a constant velocity $u = 1\text{ m/s}$. As a result of this, end B starts moving down along the wall. If V_B is the velocity of the other end B downward in m/s when the rod makes an angle $\theta = 30^\circ$ with the horizontal. Then value of $2V_B^2$ is _____



Space for rough work

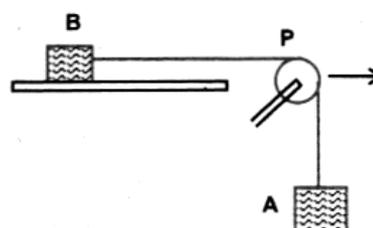
8. Two blocks of masses m_1 and m_2 are connected by inextensible massless strings as shown in the figure. Neglecting the masses of pulleys and assuming friction at any point of the system to be absent, the ratio of $\frac{m_1}{m_2}$ for equilibrium of the system is $\alpha : \beta$. Find $\alpha^2 + \beta^2$



SECTION 2 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** 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

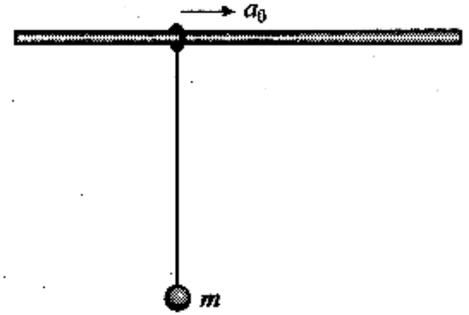
9. In the figure, the pulley P moves to the right with a constant speed u . The downward speed of the block A is V_A , and the speed of the block B to the right is V_B . Then
- (A) $V_B = V_A$
 (B) $V_B = u + V_A$
 (C) $V_B + u = V_A$
 (D) the two blocks have accelerations of the same magnitude.



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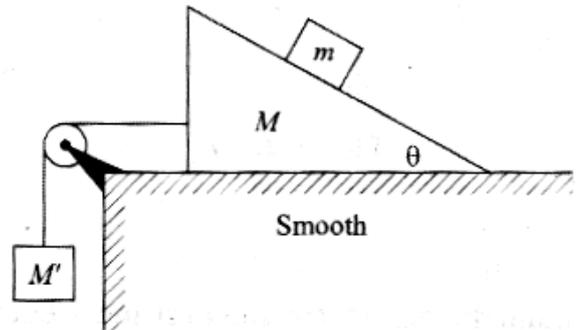
10. The ring shown in the figure is given a constant horizontal acceleration ($a_0 = g/\sqrt{3}$). Maximum deflection of the string from the vertical is θ_0 , then.

- (A) $\theta_0 = 30^\circ$
 (B) $\theta_0 = 60^\circ$
 (C) at maximum deflection, tension in string is equal to mg
 (D) at maximum deflection, tension in string is equal to $\frac{2mg}{\sqrt{3}}$



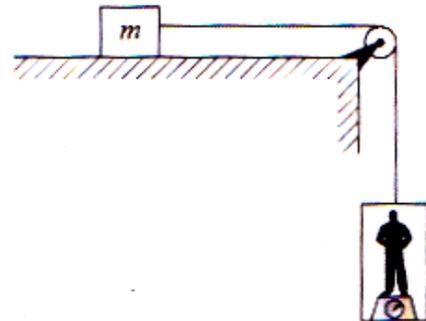
11. The figure shows a block of mass m placed on a smooth wedge of mass M . Calculate the value of M' and tension in the string, so that the block of mass m will move vertically downward with accelerating g (Take $g = 10 \text{ m/s}^2$)

- (A) The value of M' is $\frac{M \cot \theta}{1 - \cot \theta}$
 (B) the value M' is $\frac{M \cot \theta}{1 - \tan \theta}$
 (C) The value of tension in the string is $Mg \cot \theta$
 (D) the value of tension is $Mg \tan \theta$



12. In the figure, a man of true mass M is standing on a weighing machine placed in a cabin. The cabin is joined by a string with a body of mass m . Assuming no friction, and negligible mass of cabin and weighing machine, the measured mass of man is : (normal force between the man and the machine is proportional to the mass)

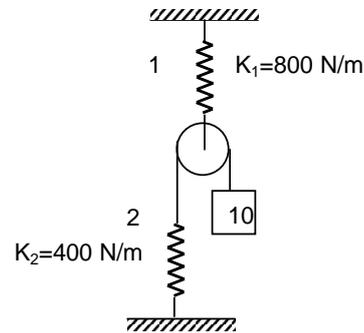
- (A) Measured mass of man is $\frac{Mm}{(M+m)}$
 (B) Acceleration of man is $\frac{mg}{(M+m)}$
 (C) Acceleration of man is $\frac{Mg}{(M+m)}$
 (D) Measured mass of man is M



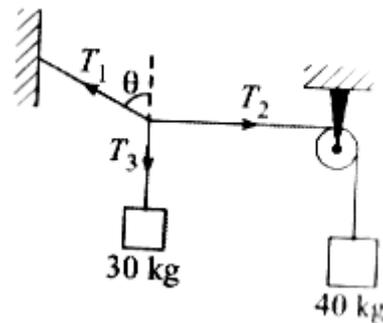
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13. A reference frame attached to the earth
 (A) Is the inertial frame as motion of earth is at uniform speed
 (B) Cannot be the inertial frame because earth is revolving around the sun
 (C) Is an inertial frame because Newton's Laws are applicable in this frame
 (D) Cannot be the inertial frame because earth is rotating about its own axis

14. A block of 10 kg is hanging with the help of a pulley and two springs, as shown. The system is at equilibrium and x_1 and x_2 are the elongation in the spring 1 and 2 respectively ($g = 10 \text{ m/s}^2$). Then.
 (A) Elongation in both the springs will be different because spring constant is different
 (B) $x_2 = 0.5 \text{ m}$
 (C) $x_1 = 0.25 \text{ m}$
 (D) $x_2 = 0.25 \text{ m}$



15. In the arrangement shown in the figure if system is in equilibrium ($g = 10 \text{ m/s}^2$)
 (A) Tension $T_1 = 50 \text{ N}$
 (B) Tension $T_1 = 500 \text{ N}$
 (C) Angle $\theta = 37^\circ$
 (D) Angle $\theta = 53^\circ$



16. A block of weight 9.8 N is placed on a table. The smooth table surface exerts an upward force of 10 N on the block. Assume $g = 9.8 \text{ m/s}^2$
 (A) The block exerts a force of 10 N on the table
 (B) The block exerts a force of 19.8 N on the table
 (C) The block exerts a force of 9.8 N on the table
 (D) The block has an upward acceleration

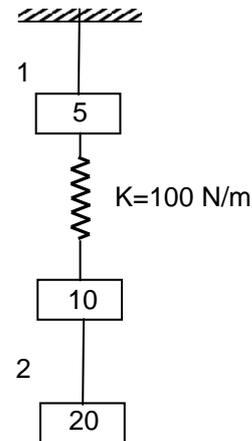
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SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** paragraphs
- ◆ Based on each paragraph, there will be **TWO** 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

Paragraph-1

In the figure given below. The system comprises of 3 blocks of 5kg , 10 kg and 20 kg, along with string 1, string 2 and a spring of spring constant 100 N/m(The system is initially at equilibrium)

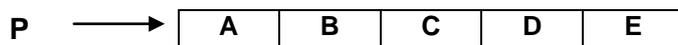


17. When the spring is cut, tension in string 1 and string 2, just after cutting, are respectively.
 (A) 350 N, 200 N (B) 50 N, 0 N
 (C) 50 N, 200 N (D) None of these
18. When string 2 is cut, tension in the string 1 and spring force values are respectively ?
 (A) 350 N, 300 N (B) 150 N, 300 N
 (C) 150 N, 100 N (D) None of these

Space for rough work

Paragraph-2

Five identical cubes each of mass 'm' are on a straight line with two adjacent faces in contact on horizontal surface as shown in figure. Suppose the surface is frictionless and a constant force P is applied from left to right to the end face of A, which of the following statement are correct



19. The acceleration of cube D is
 (A) $\frac{5P}{m}$ (B) $\frac{P}{5m}$ (C) $\frac{P}{m}$ (D) None
20. Force exerted by C on D is
 (A) P (B) $\frac{P}{5}$ (C) $\frac{3P}{5}$ (D) None

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 density of 0.5 M glucose solution is 1.09 gml^{-1} . The molality of the solution is x. Then $2x$ is
22. 112 ml of a gas is produced at STP. by the action of 405 mg of alcohol (ROH) with CH_3MgI . The molecular mass of alcohol is 'x' g/mol, then, $\left(\frac{x}{9}\right)$ is
- $\text{CH}_3\text{MgI} + \text{R-OH} \rightarrow \text{CH}_4 + \text{Mg(OR)I}$

Space for rough work

23. The molarity of 18% $\left(\frac{w}{v}\right)$ aqueous solution of urea is 1.5 x. What is the value of x ?
(Urea = NH_2CONH_2)
24. The percentage of water in $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$ is 33.6% what is the value of x.
25. Among the following, the number of elements showing only one non-zero oxidation state is
O, Cl, N, P, Na, H, C, Fe
26. The difference in the oxidation numbers of the two types of sulphur atoms in $\text{Na}_2\text{S}_4\text{O}_6$ is
27. A gas is found to have the formula $(\text{CO})_x$. It's vapour density is 70. the value of "x" must be :
28. The molarity of x% wt by volume of NaOH solution is 2.25. The value of x is :

SECTION 2 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** 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:**
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 - 0** If none of the bubbles is darkened
 - 2** In all other cases

29. Which of the following statements is/are correct ?
(A) Molality is temperature dependent
(B) Mole fraction is independent of temperature
(C) Molarity means number of moles of solute in 1000g of solvent.
(D) Mole fraction has no unit.
30. 1 mole of H_2SO_4 present in solution is exactly neutralized by
(A) 1 mole of NaOH (B) 2 mole of $\text{Ca}(\text{OH})_2$ (C) 1 mole of $\text{Ba}(\text{OH})_2$ (D) 1 mole of $\text{Ca}(\text{OH})_2$

Space for rough work

31. 100 gms of CaCO_3 reacts with 100 ml of 1 M HCl. The weight of CaCO_3 unreacted & moles of CaCl_2 formed.
 (A) 95 gms of CaCO_3 (B) 0.05 moles of CaCl_2 (C) 0.1 moles of CaCl_2 (D) 5 gms of CaCO_3
32. A sample of H_2SO_4 (density 1.8 g mL^{-1}) is 90% by weight what is the volume of the acid that has to be used to make 1 L of 0.2 M H_2SO_4 ?
 (A) 16 mL (B) 18 mL (C) 12 mL (D) 10 mL
33. Which of the following is/are true in case of an aqueous solution of 0.1 moles of potassium ferrocyanide
 $\text{K}_4[\text{Fe}(\text{CN})_6] \rightarrow 4\text{K}^+ + [\text{Fe}(\text{CN})_6]^{4-}$
 (A) It contains $(N_A/10)$ ions (B) it contains $0.5 N_A$ ions
 (C) It contains 0.5 mole of K^+ ions (D) it contains 0.10 mole of $[\text{Fe}(\text{CN})_6]^{4-}$ ions
34. In which of the following cases, oxidation state of oxygen atom changes
 (A) $\text{HSO}_4^- \rightarrow \text{H}_2\text{S}_2\text{O}_8$ (B) $\text{CrO}_4^{2-} \rightarrow \text{CrO}_5$ (C) $\text{SO}_3^{2-} \rightarrow \text{SO}_4^{2-}$ (D) $\text{OH}^- \rightarrow \text{H}_2\text{O}$
35. Which of the following molecules have equal number of atoms ?
 (A) 12g of MgSO_4 (B) 50 ml of 0.0133 M $\text{C}_2\text{H}_5\text{OH}$
 (C) 0.12 gram molecule of Fe_2O_3 (D) 4.48 L of SO_2 gas at NTP.
36. 500 ml of 0.2 M NaOH solution concentration changes to 0.4 M by
 (A) Removing 250 ml of H_2O (B) Removing 500 ml of H_2O
 (C) adding 8g of NaOH (D) adding 4g of NaOH

Space for rough work

SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** paragraphs
- ◆ Based on each paragraph, there will be **TWO** 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

Paragraph-1

36.5% (w/w) HCl has density equal to 1.20 gmL^{-1}

37. Molarity of the solution
 (A) 10 (B) 12 (C) 14 (D) 16
38. Molality of the solution
 (A) 13 (B) 15.7 (C) 16 (D) 10

Paragraph-2

Isotopes are the atoms of same element; they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus. If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio $m : n$, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. The elements which have single isotope are called monoisotopic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

39. The isotopes of chlorine with mass number 35 and 37 exist in the ratio of Its average atomic mass is 35.5.
 (A) 1 : 1 (B) 2 : 1 (C) 3 : 1 (D) 3 : 2
40. Atomic mass of boron is 10.81. It has two isotopes namely ${}^1_5\text{B}$ and ${}^x_5\text{B}$ with their relative abundance of 80% and 20% respectively. The value of x is
 (A) 10 (B) 9 (C) 12 (D) 13

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. The number of values of k for which the line $(k + 1)x + 8y = 4k$ and $kx + (k + 3)y = 3k - 1$ are coincident is
42. The sides of a triangle ABC lie on the lines $3x + 4y = 0$, $4x + 3y = 0$ and $x = 3$. Let (h, k) be the centre of the circle inscribed in $\triangle ABC$. The value of $(h + k)$ equals
43. The line $3x + 2y = 24$ meets the y -axis at A and the x -axis at B . The perpendicular bisector of AB meets the line through $(0, -1)$ parallel to the x -axis at C . If the area of triangle ABC is A , then the value of $\frac{A}{13}$ is
44. The vertices of a triangle are $A(-1, -7)$, $B(5, 1)$ and $C(1, 4)$. If the internal angular bisector of $\angle B$ meets the side AC in D , then the length AD is $\frac{2\sqrt{2}k}{3}$, then the value of k is
45. If the line $y - x - 1 + \lambda = 0$ is equidistant from the points $(1, -2)$ and $(3, 4)$, then λ is
46. Integral value of λ for which the points $(\lambda + 1, 1)$, $(2\lambda + 1, 3)$, $(2\lambda + 2, 2\lambda)$ are collinear is
47. Number of integral values of m , for which the x -coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is
48. If the image of the point $(4, -13)$ in the line $5x + y + 6 = 0$ is of the form $(-1, -2k)$, then the value of $|k|$ is

Space for rough work

SECTION 2 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** 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. A(1, 3) and C(7, 5) are two opposite vertices of a square. The equation of a side through A is
 (A) $x + 2y - 7 = 0$ (B) $x - 2y + 5 = 0$ (C) $2x - y + 1 = 0$ (D) none of these
50. The straight line L is perpendicular to the line $5x - y = 1$. The area of the triangle formed by the line L and the coordinate axes is 5, then the equation of the line is
 (A) $x - 5y = 5\sqrt{2}$ (B) $x + 5y = 5\sqrt{2}$ (C) $x + 5y = -5\sqrt{2}$ (D) none of these
51. The points (1, 3) and (5, 1) are the opposite vertices of a rectangle. The other two vertices lie on the line $y = 2x + c$, then the remaining vertices are
 (A) (2, 0) (B) (4, 4) (C) (-2, 0) (D) none of these
52. Two sides of a rhombus OABC (lying entirely in first quadrant or fourth quadrant) of area equal to 2sq. units , are $y = \frac{x}{\sqrt{3}}$, $y = \sqrt{3}x$. Then possible coordinates of B is /are ('O' being the origin)
 (A) $(1 + \sqrt{3}, 1 + \sqrt{3})$ (B) $(-1 - \sqrt{3}, -1 - \sqrt{3})$ (C) $(\sqrt{3} - 1, \sqrt{3} - 1)$ (D) none of these
53. Let $O \equiv (0, 0)$, $A \equiv (0, 4)$, $B \equiv (6, 0)$. Let P be a moving point such that the area of triangle POA is two times the area of triangle POB. The locus of P will be a straight line whose equation can be
 (A) $x + 3y = 0$ (B) $x + 2y = 0$ (C) $2x - 3y = 0$ (D) $3y - x = 0$

Space for rough work

54. The point $(a^2, a + 1)$ lies in the angle between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin if
- (A) $a \in (-3, 0)$ (B) $a \in \left(\frac{1}{3}, 1\right)$
 (C) $a \in \left(-3, \frac{1}{3}\right)$ (D) $a \in \left(\frac{1}{3}, \infty\right)$
55. ABC is an isosceles triangle. If the coordinates of the base are B(1, 3) and C(-2, 7), the coordinates of vertex A can be
- (A) $\left(6, \frac{5}{6}\right)$ (B) $\left(\frac{5}{6}, 6\right)$ (C) $\left(-7, \frac{1}{8}\right)$
 (D) any point on the line $6x + 8y + 43 = 0$
56. Angles made with the x-axis by two lines drawn through the point (1, 2) cutting the line $x + y = 4$ at a distance $\frac{\sqrt{6}}{3}$ from the point (1, 2) are
- (A) $\frac{\pi}{12}$ and $\frac{5\pi}{12}$ (B) $\frac{\pi}{8}$ and $\frac{3\pi}{8}$ (C) $-\frac{7\pi}{12}$ and $-\frac{11\pi}{12}$ (D) none of these

SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** paragraphs
- ◆ Based on each paragraph, there will be **TWO** 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

Paragraph-1

The vertex A of triangle ABC is (3, -1). The equations of median BE and angular bisector CF are $6x + 10y - 59 = 0$ and $x - 4y + 10 = 0$ respectively. Then

57. Slope of the side BC must be
- (A) $\frac{1}{9}$ (B) $-\frac{2}{9}$ (C) $\frac{1}{7}$ (D) none of these
58. The equation of AB must be
- (A) $x + y = 2$ (B) $x + 4y = 0$ (C) $18x + 13y = 41$ (D) $23x - y = 70$

Space for rough work

Paragraph-2

Equation of the line having slope 'm' and y intercept 'c' is $y = mx + c$. Equation of the line passing through (x_1, y_1) and having inclination ' θ ' with x-axis is $\frac{x - x_1}{\cos \theta} = \frac{y - y_1}{\sin \theta} = \pm r$ where $\theta \neq \frac{n\pi}{2}$ and 'r' is the distance of (x_1, y_1) from (x, y) along the line.

59. In a $\triangle ABC$, co-ordinates of A are (1, 2) and the equations of the medians through B and C are $x + y = 5$ and $x = 4$ respectively then $AB^2 - AC^2$ is
(A) 25 (B) 37 (C) 12 (D) 21
60. A(1, 1); B(4, -2); C(5, 5) are vertices of a triangle ABC then the equation of the perpendicular dropped from C to internal angular bisector of A is
(A) $x + y = 1$ (B) $y - 7 = 0$ (C) $x - 5 = 0$ (D) $2x + y = 0$

Space for rough work

FIITJEE RET – 7

(2018 – 2020)(1ST YEAR_REGULAR)

IIT-2015 (P2)_SET-B

DATE: 30.07.2018

ANSWERS

PHYSICS

1.	2	2.	1	3.	9	4.	5
5.	5	6.	9	7.	6	8.	5
9.	B,D	10.	B,C	11.	A,C	12.	A,C
13.	B,D	14.	C,D	15.	B,D	16.	A,D
17.	B	18.	A	19.	B	20.	D

CHEMISTRY

21.	1	22.	9	23.	2	24.	4
25.	1	26.	5	27.	5	28.	9
29.	B, D	30.	C, D	31.	A, B	32.	C
33.	B, D	34.	A, B,	35.	A, C, D	36.	A, D
37.	B	38.	B	39.	C	40.	A

MATHEMATICS

41.	1	42.	0	43.	7	44.	Bonus
45.	2	46.	2	47.	2	48.	7
49.	AC	50.	BC	51.	AB	52.	A
53.	AD	54.	AB	55.	BC	56.	AC
57.	B	58.	C	59.	Bonus	60.	C