FIITJEE **INTERNAL TEST (PHASE-1) CLASS-XI**

PHYSICS, CHEMISTRY & MATHEMATICS

CPT-1   **CODE : 140101.1**   **PAPER - 1**

Time Allotted: 3 Hours   **Maximum Marks: 210**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.

2. This question paper contains Three Parts.

3. **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.

4. Each part is further divided into two sections: **Section A & C.**

5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.

6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.

2. On the OMR sheet, darken the appropriate bubble with **Blue/Black Ball Point Pen** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.

3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Three Parts.

(i) **Section-A (01 – 10)** contains 10 multiple choice questions which have one or more than correct answer. Each question carries **+4 marks** for correct answer and **– 2 mark** for wrong answer.

(ii) **Section-C (01 – 10)** contains 10 Numerical based questions with single digit integer as answer, ranging from 0 to 9 and each question carries **+3 marks** for correct answer and **– 1 mark** for wrong answer

Name of the Candidate :_____

Batch   :_____ Date of Examination :_____ ___

Enrolment Number :_____

PART – I : PHYSICS

SECTION – A : (One or More than One Options Correct Type)

This section contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **one or more than one** are correct.

1. A projectile is fired at t=0 with an initial seepd $10\sqrt{3}$ m/s at an angle 60° with horizontal. At time t displacement vector makes 30° with horizontal.(take g = 10 m/s²)
    (A) t = 1 sec
    (B) t = 2 sec
    (C) displacement = 20 m
    (D) vertical component of its velocity at this instant is 10 m/s

2. A particle of mass 4 kg is projected with speed υ_0 along Y axis at t = 0 from a position (2m, 4m) in XY plane where a potential field exists with potential energy following U=4x. Total energy of the particle is 16 J.
    (A) $\upsilon_o = 2 m/s$
    (B) At the time of crossing of Y axis its velocities along X and Y axis have same magnitude.
    (C) The particle with pass through origin (0,0).
    (D) After 2sec. its displacement has magnitude of $2\sqrt{5}\, m$.

3. An inverted cone of mass m with semi apex angle $\alpha = 30°$ is placed systemetically in between two identical boxes. Each box has mass half of the mass of the cone and are placed on a horizontal frictionless floor. Chhose the correct option(s)
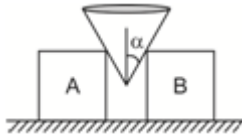

    (A) Acceleration of the cone is $\dfrac{g}{4}$

    (B) Acceleration of each box is $\dfrac{\sqrt{3}g}{4}$

    (C) Normal reaction offered to the cone by each box is equal and is $\dfrac{3mg}{4}$

    (D) If box A is fixed and B is free to move then normal reaction to the cone by box A > Normal reaction to the cone by box B.

Space for Rough Work

4. Block A of mass 5kg is placed on another block B of mass 10 kg which is placed on a smooth horizontal floor as shown in fig. The coefficients of static and kinetic friction between A and B are 0.5 and 0.4 respectively. A horizontal force F = 50 N is applied on block A. Chose the correct option(s).


(A) Acceleration of block A = 6 m/s²
(B) Acceleration of block B = 2 m/s²
(C) Max. value of F so that blocks move together is 37.5 N
(D) Max. value of F so that blocks move together is 30 N

5. In the figure shown block A is kept on a table and is being pulled by a constant velocity $v = 4\,m/s$ while bolck B is kept on a wedge of inclination θ placed on a smooth horizontal floor which is being pulled with a constant velocity $u = 4\sqrt{3}\,m/s$. The strings are inextensible and pullies are ideal. The string segment in between pullies P₁ and P₂ makes ϕ with horizontal. At certain instant when $\theta = \phi = 30°$, Chose the correct options.
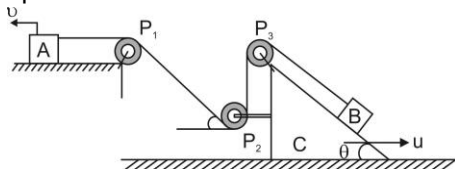
(A) Velocity of B is dependent of ϕ

(B) Velocity of B is independent of θ
(C) Velocity of B wrt wedge is 10 m/s at this instant

(D) Velocity of B wrt ground is $2\sqrt{7}\,m/s$ at this instant

6. Consider two vectors $\overline{A}$ and $\overline{B}$ such that $\overline{A} = 5\hat{i} + 12\hat{j}$ and $\overline{B}$ is along the line $4y = 3x$.
Chose the correct option(s)
(A) The magnitude of component of $\overline{A}$ along $\overline{B}$ is 11.2 units.

(B) The angle between $\overline{A}$ and $\overline{B}$ must be $\cos^{-1}\left(\dfrac{112}{130}\right)$

(C) The angle between $\overline{A} \& \overline{B}$ is independent of their magnitudes.

(D) The area of the triangle formed by unit vector $\hat{A}$ and its X and Y component is $\dfrac{30}{169}$ sq. unit.

Space for Rough Work

7. A small ball of mass m is tied with a light inextensible string of length ℓ which is nailed at its other end on a vertical wall. The ball is released form an initial position when string is horizontal with a vertically down velocity u.

    (A) The maximumn value of u is $\sqrt{7gl}$ if the string can withstand a maximum tension ten times the weight of the ball.

    (B) Minimum tension in string, if u is maximum is 4 times weight of the ball.

    (C) Speed of the ball at top most point if u is maximum is $\sqrt{5gl}$

    (D) Acceleration of the ball when it makes 60° with vertical in its downward journey if u is maximum is

    $\dfrac{g}{2}\sqrt{259}$.

8. A particle moving in a straight line covers equal distance in 2nd and 7th second of its journey. If its acceleration is 8m/s^2 and is constant throughout, then
    (A) Time taken by the particle to achieve its initial speed is 8 sec
    (B) It covers total distance of 64 m before attaining initial speed again.
    (C) Its initial speed is 32 m/s
    (D) at t = 4sec its speed is 0.

9. In the diagram two ideal springs having spring constant $K_1 = 200 \, N/m$ and $K_2 = 300 \, N/m$ are connected by an ideal string which passes over a pulley P. All pullies are massless and frictionless. A block of 6kg is hanging in equilibrium from the pulley. (take g = 10 m/s^2)
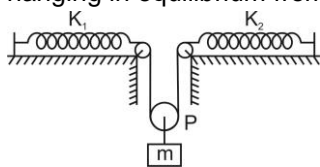
    (A) The elongation of spring with force constant K_1 is 0.20 m.

    (B) The elongation of spring with force constant K_2 is 0.10 m.

    (C) The displacement of pulley P from the position when springs were relaxed is 0.125 m.
    (D) Springs may be considered as connected in series.

    Space for Rough Work

10. A person walks with different velocities as shown in fig. In all the cases, 3 arrows show the direction of velocity of rain with respect to the person.
Chose the correct option(s)
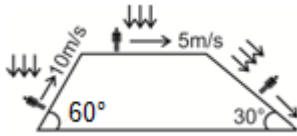
(A) Speed of rain is $\dfrac{10}{\sqrt{3}}$ m/s

(B) Velocity of rain makes 37° with horizontal line.

(C) The speed of rain with respect to the person when moving horizontally $\dfrac{5}{\sqrt{3}}$ m/s.

(D) The speed of rain with respect to the person when moving on 60° inclined plane is $\dfrac{20}{\sqrt{3}}$ m/s.

SECTION – C (Integer Answer Type)

This section contains **10 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

1. A particle is projected from ground at an angle 60° with horizontal with a speed of $10\sqrt{3}$ m/s from point A as shown. At the same time the sufficient long wedge is made to move with constant velocity of $10\sqrt{3}$ m/s towards right shown in figure. The distance in m. along the inclined plane where the particle will hit the wedge will be 10n. Find n. (take g = 10 m/s²)
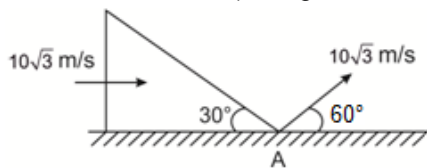

2. Velocity of a particle in a straight line motion is given by $v = 4t - t^2$. Where v is in m/s and t is in second. The area under acceleration time graph in the duration when the particle decelerates is 2n. Find n [take acceleration in m/s² as y axis and time in sec as x axis]
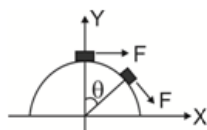
Space for Rough Work

3. A particle of mass m=6 kg is projected with velocity u=10m/s at an angle $\theta = 60°$ with horizontal. During the period when the particle descends from highest point to the position where its velocity vector makes 30° with horizontal, work done by gravity is 5x J. Find x.

4. The system shown in figure is in equilibrium. Find the ratio of accelerations of masses m and 2m just after the string connecting them is cut.
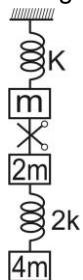
5. A bird flies in vertical X-Y plane along a curve $y^2 = Kx$. A dog runs in a straight line along X axis with a speed half of the speed of the bird. When the birds is at $x = \dfrac{1}{2}m$ the dog finds it flying vertically up. Find K.
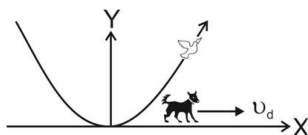
6. A particle of mass m is placed on a smooth verticle hemispherical track and is acted upon by a force F = n mg $\sin\theta$ always acting tangential to the track. If the mass loses contact at $\theta = 37°$, find n.

7. The resultant of these four forces shown in fig is (7x) N Find x.
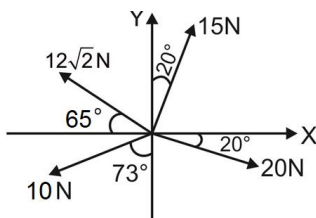
Space for Rough Work

8. A man of mass 50 kg stands on a frame of mass 30kg which he pulls by a light rope which passes over a puley. The other end of the rope is attached to the frame. The system moves down with constant acceleration 2m/s^2. The force that the man must exert on the rope is 40x N. Find x. (take g = 10 m/s^2)
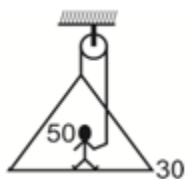
9. A particle of mass 1 kg slowly dragged up a rough plane following y^2=40x. the force always acts tangential to the plane and of constant magnitude. The coefficient of friction between particle and plane is $\mu = 0.4$. If the work done by force untill it reaches a height 20m is 60x J. Find x. (take g = 10 m/s^2)
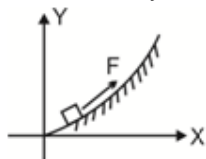
10. A block of mass m=2kg rests on a bracket of mass M=2m. the coefficients of friction between block and bracket are $\mu_s = \dfrac{8}{15}$ and $\mu_k = \dfrac{6}{15}$. The bracket rests on a frictionless surface. What is the maximum force F in Newton that can be applied if the block is not to slide on the bracket.
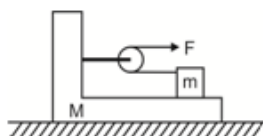
Space for Rough Work

PART – II :CHEMISTRY

SECTION – A : (One or More than One Options Correct Type)

This section contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **one or more than one** are correct.

1. Boyle's law is represented by

    (A)   (B)   (C)   (D)

2. According to Charle's law:

    (A) $V \propto \dfrac{1}{T}$ (B) $\left(\dfrac{dV}{dT}\right)_P = constant$ (C) $\left(\dfrac{dT}{dV}\right)_P = constant$ (D) $\left(\dfrac{1}{T} - \dfrac{V}{T^2}\right) = 0$
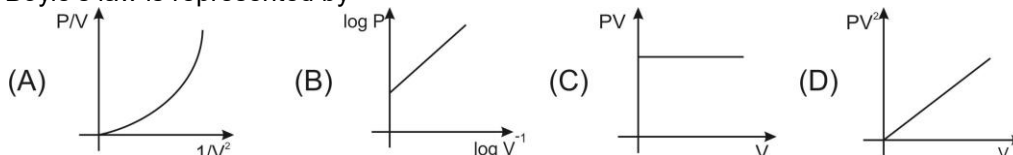
3. Incorrect order if decreasing oxidation number of S in compound is

    (A) $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$ (B) $H_2SO_5 > H_2SO_3 > SCl_2 > H_2S$

    (C) $SO_3 > SO_2 > H_2S > S_8$ (D) $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

4. Which of the following molecules have equal number of atom

    (A) 12 g of $MgSO_4$ (B) 50 mL of 0.0133 M ethanol

    (C) 0.12 g molecule of Fe_2O_3 (D) 4.48L of SO_2 (g) at STP

5. Select incorrect order for the given properties

    (A) Thermal Stability   : $BaSO_4 > SrSO_4 > CaSO_4$

    (B) Solubility   : $BaSO_4 > SrSO_4 > CaSO_4$

    (C) Thermal stability   : $Li_2CO_3 < Na_2CO_3 < K_2CO_3$

    (D) Solubility   : $Li_2CO_3 > Na_2CO_3 > K_2CO_3$

6. Select the correct statement(s) :

    (A) CH_3NCS is angular while SiH_3NCS is linear

    (B) Both CH_3NCS and SiH_3NCS are linear

    (C) CH_3NCS is linear while SiH_3NCS is bent

    (D) The Lewis acid strength of boron halides runs as $BF_3 < BCl_3 < BBr_3 < BI_3$

7. Select the correct statement(s):

    (A) The larger anion with more negative charges are more polarizable

    (B) The polarizability sequence is $I^- > Br^- > Cl^- > F^-$

    (C) The covalent character runs in the order $ZnCl_2 < CdCl_2 < HgCl_2$

    (D) The polarizing power among the transition series varies as follows:

    $3d - series < 4d - series < 5d - series$.

Space for Rough Work

8. In which of the following arrangements is/are the order correct according to the property indicated against it?

(A) Increasing size : $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (B) Increasing I.E.$_1$: B < C<O<N

(C) Increasing E.A.$_1$: I <Br < F<Cl   (D) Increasing metallic radius : Li<Na<K<Rb

9. Select the incorrect statement(s) from the following options:

(A) the nodal plane of P_x identical with that of P_y orbital

(B) d_{yz} orbital has two nodal plane which are xz and yz plans

(C) p_x, p_y and p_z orbitals have the same value of $'\ell'$

(D) $d_{xy}, d_{x^2-y^2}$, and d_{z^2} orbital have the different orientation in space but have the same value of 'm'

10. Select correct statement(s)

(A) For a particular orbital in hydrogen atom, the wave function may have negative value

(B) $3dx^2–y^2$ orbital has two angular node and one Radial node

(C) xy and yz planes are nodal planes for d_{xz} orbital

(D) Radial probability Distribution function may have zero value but can never have negative value.

SECTION – C (Integer Answer Type)

This section contains **10 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

1. When $BeCl_2$ undergoes hydrolysis in alkaline medium, then what is the coordination number of Be in product?

2. The first four ionization energy values of an element are 120, 240, 520 and 6420 kcal. The number of valence electrons in the element is

3. Potassium dichromate in alkaline solution with 30% H_2O_2 produces K_3CrO_8. How many peroxide linkage are found in the structure of K_3CrO_8

4. Find the sum of Bond order and number of π bonds in B_2 molecule on the basis of molecular orbital theory

5. Find the maximum number of electrons in Cr atom which have m = –1 and S= +1/2 but $n \neq 2$

6. Angular velocity (w) of an electron occupying second orbit of He$^+$ ion is $\dfrac{x\pi^3 me^4}{h^3}K^2$ .Find x

7. At 400 K, the root mean square speed of a gas x (molecular weight= 30) is equal to the most probable speed of gas y at 60 K. The molecular weight of the gas y is

8. The stopcock, connecting the two bulbs of volumes 5L and 10 L containing an ideal gas at 9 atm and 6 atm respectively is opened. What is the final pressure in the two bulbs if the temperature remained the same

9. 0.262 g impure sample of copper ore is dissolved and Cu^{2+} is titrated with KI solution. I$_2$ liberated required 40 mL of 0.1 M $Na_2S_2O_3$ solution for titration. What is the % impurities in the ore?

10. 10 moles of a solution containing an ion A^{x+} require 4 moles of MnO_4^- for the oxidation of A^{x+} to AO_3^- in acidic medium. Find x

Space for Rough Work

PART – III :MATHEMATICS

SECTION – A : (One or More than One Options Correct Type)

This section contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **one or more than one** are correct.
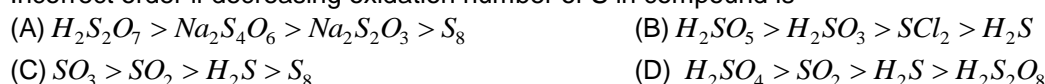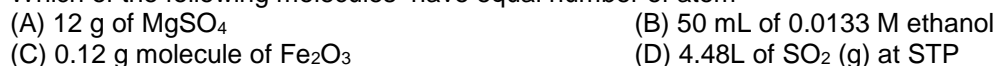
1. Number of integers satisfying $\dfrac{\left(x^2-1\right)}{x^{-2}} \le 0$

   (A) 0   (B) 1   (C) 3   (D) None of these

2. The solution of the equation $|x-3|^{x^2-6x+6} = |x-3|^{-2}$ is/are

   (A) $x=2$ (B) $x=3$ (C) $x=4$ (D) All 2, 3, and 4

3. If $f(x) = 5\cos x + 3\cos\left(x+\dfrac{\pi}{3}\right)+3,$ then for any $x \in \square$ $f(x)$ lies in

   (A) $\left[-5,11\right]$ (B) $\left[-4,10\right]$ (C) $\left[-5,10\right]$ (D) $\left[-4,11\right]$

4. If $\int \dfrac{\sin x\, dx}{\sin(x-\alpha)}\, dx = Ax + B\,\ln\left|\cos ec\left(x-\alpha\right)\right|+c,$

   (A) $A=\cos\alpha$ (B) $B=-\sin\alpha$ (C) $B=\sin\alpha$ (D) $A=-\cos\alpha$

5. Two sides of a rhombus ABCD are parallel to lines $y=x+2$ and $y=7x+3$. If the diagonals of the rhombus intersect at point (1, 2) and the vertex A is on y – axis, then co-ordinates of A, may be

   (A) $\left(0,\dfrac{7}{2}\right)$ (B) $\left(0,\dfrac{3}{2}\right)$ (C) $\left(0,\dfrac{5}{2}\right)$ (D) $(0,0)$

6. A variable line 'L' is drawn through O (0, 0) to meet the lines $L_1 : y-x-10=0$ and $L_2 : y-x-20=0$ at point A and B respectively. A point P is taken on 'L' such that $\dfrac{2}{OP}=\dfrac{1}{OA}+\dfrac{1}{OB}$, then locus of 'P' is /are

   (A) $3x+3y=40$ (B) $3x+3y=-40$ (C) $3x-3y=40$ (D) $3y-3x=40$

7. The equation of the circle which touches the axis of coordinates and the line $\dfrac{x}{3}+\dfrac{y}{4}=1$ and whose centre lies in the first quadrant is $x^2+y^2-2\lambda x-2\lambda y+\lambda^2=0$ then 'λ' is equal to

   (A) 1   (B) 2   (C) 3   (D) 6

Space for Rough Work

8. Equation(s) of the circle(s) with centre (4, 3) touching the circle $x^2 + y^2 = 1$ is/are

(A) $x^2 + y^2 - 8x - 6y - 9 = 0$ (B) $x^2 + y^2 - 8x - 6y + 11 = 0$

(C) $x^2 + y^2 - 8x - 6y - 11 = 0$ (D) $x^2 + y^2 - 8x - 6y + 9 = 0$

9. Which of the following statements is/are not correct

(A) $\log(xy) = \log x + \log y$ whenever $\log(xy)$ defined

(B) $\log|x|^k = k \log|x|$ for all $x \in \square$

(C) $a^{\log_x b} = b^{\log_x a}$ is true when log$_x$a and log$_x$b are defined

(D) log $_y$x= $\dfrac{1}{\log_x y}$ whenever $\log_y x$ is defined

10. If $f(x) = x^3 + x^2 f'(1) + x f''(2) + f'''(3)$ for all $x \in \square$ the

(A) $f'(1) = -5$ (B) $f''(2) = 2$ (C) $f'(0) = 2$ (D) $f''(1) = -4$

SECTION – C (Integer Answer Type)

This section contains **10 questions**. Each question, when worked out will result in **one integer** from 0 to 9 (both inclusive).

1. The value of $\displaystyle\lim_{x \to 1} \dfrac{(x-1)(x^2-1)(x^3-1)(x^4-1)}{\left\{(x-1)(x^2-1)\right\}^2}$

2. If the area of the triangle formed by the lines $7x - 2y + 10 = 0$, $7x + 2y - 10 = 0$ and $y = 2$ is A, then $\dfrac{7}{2} A$ is equal to -------------

3. Consider the points $A \equiv (3,4), B \equiv (7,13)$. If $P(\alpha, \alpha)$ be a point on the line $y = x$ such that PA + PB is minimum, then $[\alpha]$ is (where $[x]$ denotes greatest integer less than or equal to x) _____

4. Number of integers satisfying the inequality $\left(|x-3|+|x+3|\right)\left(|x-2|+|x+2|\right) \leq 24$ is

Space for Rough Work

5.   If $8x^3 - 4x^2 - 4x + 1 = 8\left(x - \cos\dfrac{\pi}{7}\right)\left(x - \cos\dfrac{3\pi}{7}\right)\left(x - \cos\dfrac{5\pi}{7}\right)$

       Then the value of $8\sin\dfrac{\pi}{14}\sin\dfrac{3\pi}{14}\sin\dfrac{5\pi}{14}$ is

6.   The number of common tangents to the circle $x^2 + y^2 = 4$ and $x^2 + y^2 - 6x - 8y - 24 = 0$ is -----

7.   Two circles $x^2 + y^2 + px + py - 7 = 0$ and $x^2 + y^2 - 10x + 2py + 1 = 0$ are orthogonal, then the larger value of p is

8.   If the lines represented by $2x^2 - 5xy + 2y^2 = 0$ be two sides of a parallelogram and the line 5x+2y=1, be one

       of its diagonal, and if the equation of other diagonal is $ax + by = 0$, then $\dfrac{1}{3}|a - b|$ is equal to

9.   Number of order pair (x, y) which satisfy $\log_x(xy) \times \log_y(xy) + \log_x(x - y) \times \log_y(x - y) = 0$ is

10.   The value of $\displaystyle\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \dfrac{dx}{1 + \cos x}$ is

Answer Key – SET A
PAPER -1
CLASS – 11, PHASE TEST – 1, B LOT

Part – I			Part – II			Part – III		
(PHYSICS)			(CHEMISTRY)			(MATHEMATICS)		
1.	**B,C**	P110313	1.	**BCD**	C113502	1.	**A**	M112402
2.	**A,B,D**	P110512	2.	**BCD**	C113502	2.	**A,C**	
3.	**B,D**	P110413	3.	**CD**	C110204	3.	**A, B, C, D**	M111404
4.	**A,B,C**	P110412, P110413	4.	**ACD**	C110202	4.	**A,B**	M112408
5.	**A,C,D**	P110409	5.	**BD**	C113004	5.	**C,D**	M110726,M110727
6.	**A,B,C,D**	P111607	6.	**AD**	C113612	6.	**D**	M110715
7.	**A,B,C,D**	P110505	7.	**ABCD**	C113608	7.	**A,D**	M110808
8.	**B,C,D**	P111605	8.	**ABCD**	C112905	8.	**C,D**	M110813
9.	**B,C,D**	P110413,P110409	9.	**ABD**	C112806	9.	**A, B, D**	M112403
10.	**A,C,D**	P111623	10.	**ACD**	C112806	10.	**A, B, C, D**	M112407
Integer Type			Integer Type			Integer Type		
1.	**2**	P111622, P110314	1.	**4**	C113017	1.	**6**	M112406
2.	**2**	P111606	2.	**3**	C110703	2.	**9**	M110708
3.	**5**	P110502	3.	**4**	C113605	3.	**4**	M110738
4.	**2**	P110413	4.	**2**	C113615	4.	**5**	M112402
5.	**6**	P110320	5.	**2**	C112806	5.	**1**	M111412
6.	**1**	P110507, P110502	6.	**4**	C110103	6.	**1**	M110813
7.	**3**	P110216	7.	**3**	C112004	7.	**3**	M110821
8.	**8**	P110413	8.	**7**	C113503	8.	**7**	M110730
9.	**4**	P110507, P110502	9.	**3**	C111104	9.	**1**	M112403
10.	**8**	P110412, P110413	10.	**3**	C111101	10.	**2**	M112409