Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE **A**

IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

Date : 30th December 2018

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

SECTION I
PHYSICS

PART I

This part contains 25 questions each

PHYSICS : 1-25 , CHEMISTRY : 31-55, MATHEMATICS : 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

PART II

This part contains 5 questions each

PHYSICS : 26-30, CHEMISTRY : 56-60, MATHEMATICS : 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

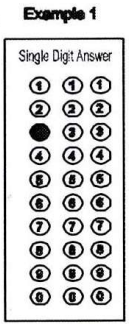
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

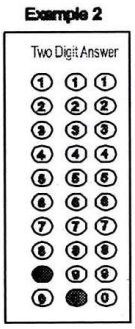
If Single Digit Answer

If answer is 3



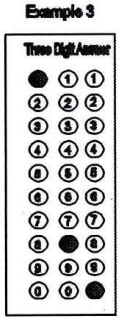
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



1. Which statement is correct among the following for gravitational acceleration (g) due to earth?

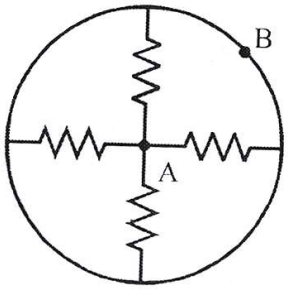
   A) The value of g is equal at poles and equatorial circle

   B) The value of g is more at poles than at equatorial circle

   C) The value of g is more at equatorial circle than at poles

   D) None of these

2. What is the equivalent resistance of the network between points A and B? (each resistance is of value r)

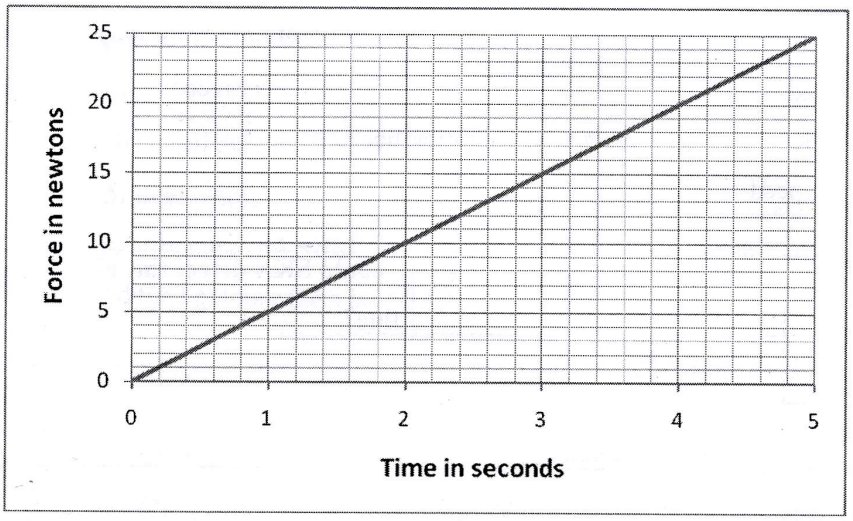


A) $\frac{r}{2}$ B) 4r C) $\frac{r}{4}$ D) Zero

3. The velocity of sound wave in a given medium is V when its frequency is v. The velocity, when frequency changes to 5v is

   A) 5 V B) V/5 C) 25 V D) V

4. A variable force is exerted on a body of constant mass. The body, initially at rest, moves in a straight line. The following graph shows how the force varies with time. All frictional forces are ignored



If the velocity of the object is 7.0 ms^{-1} after 2.0 s, the velocity after 3.4 s will be approximately

A) 20.2 ms^{-1} B) 17.0 ms^{-1} C) 11.9 ms^{-1} D) 28.9 ms^{-1}

5. A bird is in a wire cage hanging from a spring balance. The reading of the balance is taken when the bird flying about in the cage, and when the bird is at rest in the cage. The first reading will be

A) Less than the second

B) Greater than the second

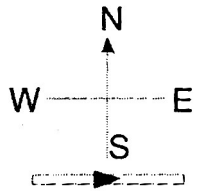
C) Much greater than the second

D) Same as the second

6. A beam of alpha particles moving towards east is deflected towards south by magnetic field. The direction of magnetic field is

A) Towards south B) Towards east C) Downward D) Upward

7. A constant current I flows in a horizontal wire in the plane of the paper from West to East as shown in the figure. The direction of magnetic field at a point will be South to North



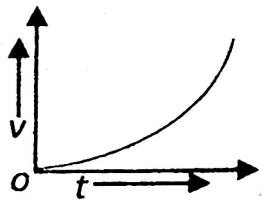
A) Directly above the wire

B) Directly below the wire

C) At a point located in the plane of the paper, on the north side the wire

D) At a point located in the plane of the paper, on the south side of the wire

8. The velocity-time graph of moving body is shown in the figure



Which of the following statement is true?

A) The acceleration is constant and positive

B) The acceleration is constant and negative

C) The acceleration is increasing and positive

D) The acceleration is decreasing and negative

9. A packet of weight W was allowed to fall freely in a water tank with acceleration 'a' (<g). The magnitude of resistance force offered by water is

A) $w\frac{g}{a}$ B) $w\frac{a}{g}$ C) $w\left(1-\frac{a}{g}\right)$ D) $w\left(1+\frac{a}{g}\right)$

10. A heater coil is cut in to two equal parts and only one part is now used in the heater instead of the original one. Heat generated by one half of the coil would be how much in comparison to that of the full length coil?

A) 4 times B) 2 times C) Half D) $\frac{1}{4}^{th}$

11. A convex spherical mirror is considered as a suitable rear view mirror for automobiles, because

A) It always produces virtual, erect and diminished images

B) It always produces real, erect and magnified images

C) It always produces real, inverted and diminished images

D) It always produces virtual, inverted and magnified images

12. Had Newton and Einstein shaken their hands, which fundamental force they would have exerted on each other (During shaking their hands)?

A) Frictional B) Electromagnetic C) Gravitational D) Mechanical

13. Three identical electric bulbs are connected parallel to each other. On connecting their combination across a source of emf having stabilized voltage and negligible resistance, all bulbs glow with full brightness. Suddenly a bulb fuses. The other bulbs will blow

A) Brighter B) Dimmer

C) With same initial intensity D) Zero, as those will also fuse

14. In dispersive materials

A) The angle of refraction for a light ray depends on the wavelength of light

B) The angle of refraction for a light ray does not depend on the wavelength of light

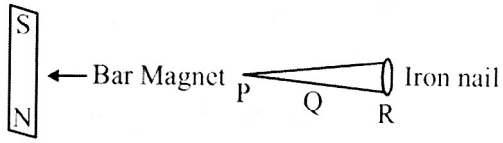
C) The angle of reflection from the surface of the material does not depend on the wavelength of light

D) Both A & C hold true

15. Knowing that mass of the moon is M/81, find distance of a point from moon where gravitational field due to earth and moon cancel each other. Given that distance between earth and moon = 60R, Radius of Earth=R, Mass of Earth = M

A) 2 R B) 6 R C) 4 R D) 8 R

16. A bar magnet is used to pick up an Iron nail



At which part P, Q and R is the easiest for the magnet to pick up the iron nail?

A) At P

B) At Q

C) At R

D) It makes no difference at any part

17. An athlete completes one round of a circular track of radius R in 40 seconds. The displacement at the end of 2 minutes 20 seconds will be

A) Zero B) 2R C) πR D) $7\pi R$

18. Magnetic field due to current through a ....., is similar to magnetic field produced by a bar magnet

A) Circular loop of conducting wire

B) Rectangular loop of conducting wire

C) Solenoid

D) Thick copper wire

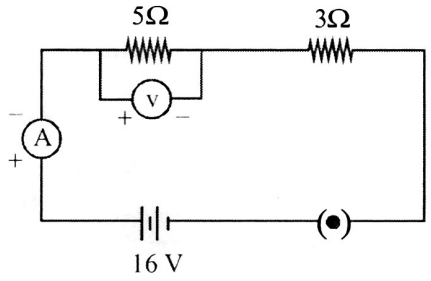
19. Choose the wrong statement related to refraction of light

A) Twinkling of stars

B) Oval shape of sun in morning and evening

C) Object in water appears bigger in size

D) Red light undergoes dispersion, while passing through prism

20. 

In the above electrical circuit, the readings shown by the ammeter and voltmeter are :

A) 2A, 10 V B) 3.2 A, 16 V C) 2A, 16 V D) 3.2 A, 10 V

21. A stone is dropped from the top of a tower 490 m high into a pond of water at the base of the tower. The splash is heard after (Given g = 9.8 m/s^2, speed of sound = 350 m/s)

A) 11.4 sec B) 10 sec C) 22.8 sec D) 20 sec

22. If an object is moving with constant velocity, then the motion is

A) Non-uniform speed B) Uniform acceleration C) Uniform motion D) Non-uniform motion

23. The process of re-emission of absorbed light in all directions with different intensities by the atom or molecule is called

A) Scattering of light B) Dispersion of light C) Reflection of light D) Refraction of light

24. In which case of a moving body force is not needed?

A) To increase the speed of the body

B) To decrease the momentum of the body

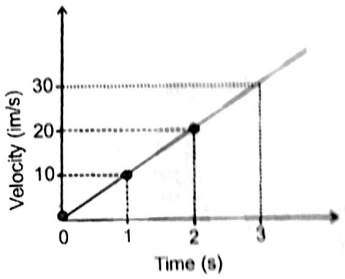
C) To change the direction of motion

D) To keep the body in uniform velocity

25. The ratio of electric field intensity at distance 5 cm to that at 10 cm from a point charge 5Q in air is

A) 2 : 1 B) 1 : 2 C) 1 : 4 D) 4 : 1

26. Velocity-time graph of a body moving with uniform acceleration is shown in the diagram. The distance travelled by the body in 3 seconds is (answer in m)



27. If x calories of heat are supplied to 15 g of water, its temperature rises from 20^0C to 24^0C. If specific heat for water is 1 cal $g^{-1}\,{}^0C^{-1}$, then the value of x is

28. Determine the potential difference between ends of a wire of resistance 5Ω is 720 C charge passes through it per minute (in V)

29. A Diwali rocket is ejecting 0.05 Kg of gases per second at a velocity of 400 m/s. What is the accelerating force on the rocket? (answer in Newton)

30. A car travels from Chennai to Bengaluru with a speed of 60 km/hr and returns back along the same path with a speed of 40 km/hr. The average speed of the car is given by : (answer in km/hr)

31. The oxide among the following that react with both dil. HCl and aqueous NaOH is

A) ZnO B) CO_2 C) SiO_2 D) CaO

32. Oxygen gas is not liberated on heating

A) K_2CO_3 B) $KMnO_4$ C) $NaNO_3$ D) $KClO_3$

33. Magnesium has three natural isotopes. The isotopic masses and relative abundance are given below

isotopic mass	23.98 u	24.98 u	25.98 u
relative abundance	78.46%	10.08%	11.46%

The average atomic mass of natural magnesium is

A) 24.31 u B) 24.68 u C) 24.29 u D) 24.48 u

34. A colourless crystalline solid 'B' dissolved easily in water. On addition of dilute HCl to the aqueous solution of 'B', no change was observed. When NaOH was added to the aqueous solution of 'B', a white ppt was obtained that dissolved in excess, giving a colourless solution. 'B' is :

A) $MgSO_4$ B) $Pb(NO_3)_2$ C) $AgNO_3$ D) $ZnSO_4$

35. The formula of ammonia is NH_3 and that of Magnesium chloride $MgCl_2$. The formula of Magnesium nitride is

A) MgN_2 B) Mg_2N_3 C) Mg_3N_2 D) $Mg(NO_3)_2$

36. A student adds 5.85 gm of NaCl to 1 litre of water (the pH of which was measured to be 7.0) in a flask (X) to make a 0.1 M solution. He transfers 500 ml into another flask (Y). He covers the flask (Y) with tissue paper and the original flask (X) with a watch glass and goes to watch a movie. When he returns to the lab the next morning, he checks the pH of both the solutions using a perfectly calibrated pH meter. Which of the following is correct?

A) X has pH =7 and Y has pH > 7

B) X has pH < 7 and Y has pH = 7

C) X has pH = 7 and Y has pH < 7

D) Both X and Y have pH = 7

37. Heavy water is

A) Water containing heavy metal salts dissolved in it

B) Water at 4^0 C, the temperature of maximum density for water

C) Deuterium oxide

D) Water saturated with oxygen gas

38. The amount of energy released during the combustion of unit mass of fuel is called

A) efficiency B) calorific value C) octane number D) packing fraction

39. The substance formed on passing chlorine gas through slaked lime is

A) Soda lime B) Bleaching powder C) Chloral D) quick lime

40. Which among the following is not a monobasic acid ?

A) Hydrochloric acid B) Nitric acid C) Acetic acid D) Carbonic acid

41. If the nucleus of hydrogen atom in a sphere of radius 1 cm. The distance at which the electron in the atom is moving round the nucleus is

A) 10 cm B) 100 cm C) 100 m D) 1000 m

42. Ammonia gas is formed when ammonium chloride react with

A) Conc. H_2SO_4 B) $Ca(OH)_2$ C) $NaNO_2$ D) dil. HCl

43. International mole day is

A) 23rd October 6.02 am to 6.02 pm

B) 22nd April 6 am to 6 pm

C) 5th June 12 am to 12 pm

D) 30th January 11 am to 11 pm

44. The beach sands of Kerala is a source of minerals like monazite. Monazite is the source of Thorium. Monazite also contain Neodymium and Cerium. The metals Thorium, Neodymium and Cerium belong to which block of modern long form of periodic table ?

A) s - block B) p - block C) d - block D) f - block

45. Food containers made of iron are coated with tin and not with zinc because

A) Zinc has higher m.p compared to Sn

B) Zinc is costly compared to Sn

C) tin is more reactive compared to Zn

D) Zinc is more reactive compared to Sn

46. The metal among the following that react with steam but not with cold water or hot water is

A) Sodium B) Calcium C) Magnesium D) Iron

47. The coloured compound among the following is

A) $CaSO_4 \cdot 2H_2O$ B) $(CaSO_4)_2 \cdot H_2O$

C) $Na_2CO_3 \cdot 10H_2O$ D) $CuSO_4 \cdot 5H_2O$

48. Baking soda is

A) $Na_2CO_3 \cdot 10H_2O$ B) NaOH C) $NaHCO_3$ D) $(NH_4)_2CO_3$

49. Stinging hair of nettle leaves inject which compound to human body when touched ?

A) Methanoic acid B) Ethanoic acid

C) Oxalic acid D) Citric acid

50. Acidity in stomach is got rid of by using antacids. The substance among the following that can be used as antacid is

A) lemon juice B) Vinegar

C) Milk of magnesia D) aerated soft drinks

51. Rain is called acid rain when the pH of rain water is

A) less than 5.6 B) more than 6.5 C) more than 7 D) less than zero

52. On passing CO_2, lime water is turned milky due to formation of

A) $Ca(OH)_2$ B) $Ca(HCO_3)_2$ C) $CaCO_3$ D) CaO

53. The correct set of co-efficients for the balanced equation is

$$p\ Al(s) + q\ Fe_3O_4(s) \rightarrow r\ Al_2O_3 + s\ Fe(s)$$

A) p = 3 q = 4 r = 2 s = 4

B) p = 8 q = 3 r = 4 s = 9

C) p = 8 q = 4 r = 3 s = 9

D) p = 6 q = 2 r = 3 s = 6

54. Aqua regia is

A) a mixture of conc. H_2SO_4 & HNO_3 in 1 : 1 ratio

B) a mixture of conc. HNO_3 & HCl in the ratio 1 : 3

C) a mixture of conc. HCl & H_2SO_4 in the ratio 1 : 2

D) conc. H_2SO_4 containing SO_3 dissolved in it

55. Anodising is the process of

A) coating iron with Zinc

B) coating Copper with tin

C) forming oxide layer over aluminium

D) forming carbide layer over steel

56. Considering the first 100 elements, how many are gaseous elements at one atmospheric pressure and 25^0 C temperature ?

57. A gold ornament is Hallmarked 750. The purity of gold used to make the ornament expressed in carats is .....

58. 2 g H_2 gas and 35.5 g Cl_2 gas react in presence of sunlight to form HCl gas. How many moles of HCl gas is formed ?

59. An element with mass number 81 contains 31.7% more neutrons than protons. Give the atomic number of the element

60. Till today how many elements are officially named and accepted by IUPAC officially?

61. If n is a perfect square then the next perfect square greater than n is

A) $n^2 + 1$ B) $n^2 + n$ C) $n + 2\sqrt{n} + 1$ D) $2n + 1$

62. If the polynomial $2x^3 + ax^2 + 3x - 5$ and $x^3 + x^2 - 4x + a$ leave the same reminder when divided by $x - 2$ then the value of a is

A) $\frac{13}{3}$ B) $\frac{-13}{3}$ C) $\frac{3}{13}$ D) $\frac{-3}{13}$

63. In a quadratic equation $ax^2 + bx + c = 0$, if both roots are (+) ve then

A) a and b are same sign c is opposite sign

B) a, b, c are (+) ve

C) a, b, c are (-v) ve

D) a and c are same sign b is opposite sign

64. A factor of $x^3 - 6x^2 - 6x + 1$ is

A) $2x + 1$ B) $x - 1$ C) $x - 2$ D) $x + 1$

65. The equations $2x - 3y + 5 = 0$ and $6y - 4x = 10$ when solved have

A) no solution

B) only one solution

C) only two solutions

D) an infinite number of solution

66. Find the common difference of an A.P. where first term is 100 and the sum of whose first 6 terms is 5 times. The sum of the next 6 terms

A) 10 B) –5 C) 6 D) –10

67. Find the angle between the minute hand of clock and hour hand when the time is 7 : 20

A) 90° B) 105° C) 100° D) 110°

68. The length of the shadow of a pole is $\sqrt{3}$ times the length of the pole, then angle of elevation of the sun is

A) 30° B) 60° C) 90° D) 45°

69. If $\sin\theta + \cos\theta = 1$ then $\sin\theta \cos\theta =$

A) $\frac{1+\sqrt{2}}{1+\sqrt{3}}$ B) $\frac{1}{\sqrt{3}-1}$ C) 1 D) 0

70. If the points (0, 4), (4, 0) and (6, 2P) are collinear then the value of P is

A) –1 B) 7 C) 6 D) 4

71. If the sum of interior angles of a convex polygon is 1620° then its number of sides are

A) 10 B) 11 C) 12 D) 13

72. The number of triangles with any three of the lengths 1, 4, 6, 8 are

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

73. In a circle a 16 unit long chord is at a distance 6 units away from the centre, find the distance of a 12 unit long chord from the centre is

A) 5 B) 6 C) 7 D) 8

74. The circumference of the circumcircle of the triangle formed by x-axis, y-axis and the graph of $3x + 4y = 12$ is

A) 3π B) 4π C) 5π D) 6π

75. The mean of first n natural numbers is $\frac{5n}{9}$, find n

A) 5 B) 4 C) 9 D) 10

76. The arithmetic mean of the set of observations $1^2, 2^2, 3^2 \ldots\ldots n^2$ is

A) $\frac{n(n+1)}{6}$ B) $\frac{(n+1)(2n+1)}{6}$ C) $\frac{(n-1)(2n+1)}{6}$ D) $\frac{(n+1)(2n-1)}{6}$

77. The mean of first n odd natural numbers is $\frac{n^2}{81}$ find n

A) 9 B) 81 C) 27 D) 36

78. If a solid sphere of radius 10 cm is moulded into 8 spherical solid balls of equal radius then the surface area of each ball is

A) 100π B) 75π C) 60π D) 50π

79. If the centre of the circle is (5, 4) and touch the y-axis then its radius is

A) 4 B) 5 C) 9 D) 1

80. The point on the y-axis which is equidistant from A (–5, –2) and B (3, 2) is

A) (–4, 0) B) (–2, 0) C) (0, –2) D) (0, –4)

81. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, then the value of a is

A) –1 B) –5 C) 1 D) 5

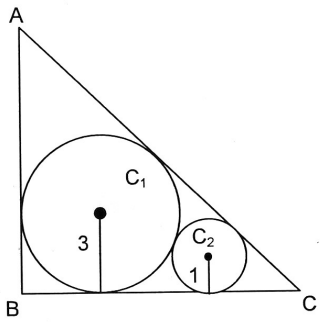
82. A vertical pole of height 10 metres stands at one corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30°, while that from another corner is 60°. The area (in m^2) of rectangular field is

A) $\frac{200\sqrt{2}}{3}$ B) $\frac{400}{\sqrt{3}}$ C) $\frac{200\sqrt{2}}{\sqrt{3}}$ D) $\frac{400\sqrt{2}}{\sqrt{3}}$

83. A circle is inscribed in a square and the square is circumscribed by another circle. What is the ratio of the areas of the inner circle to the outer circle?

A) 1 : 2 B) 1 : $\sqrt{2}$ C) $\sqrt{2}$: 4 D) 1 : $\sqrt{3}$

84. In the adjoining figure, ABC is a triangle in which $\angle B = 90°$ and its incircle C_1 has radius 3. A circle C_2 of radius 1 touches sides AC, BC and the circle C_1. Then length AB is equal to



A) $3 + 6\sqrt{3}$ B) $10 + 3\sqrt{2}$ C) $10 + 2\sqrt{3}$ D) $9 + 3\sqrt{3}$

85. If the vertices of an equilateral triangle have integral co-ordinates, then

A) such a triangle is not possible

B) the area of the triangle is irrational

C) the area of the triangle is an integer

D) the area of the triangle is rational but not an integer

86. If $56^2 - 49^2 = 7P$ then P =

87. If the system of the equation $2x + ky = 7,\ 2kx + 3ky = 20$ has no solution then the value of k is

88. The first term of an AP is 5, the last term is 45 and the sum is 400, then the fourth term of an AP is

89. The shortest distance of the point (2, 3) from the X axis is

90. A thin wire is bent into the form of a circle of radius 7 cm, if a square is made out of the wire then the side of the square would be

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	B	31.	A	61.	C
2.	C	32.	A	62.	B
3.	D	33.	A	63.	D
4.	A	34.	D	64.	D
5.	A	35.	C	65.	D
6.	D	36.	C	66.	D
7.	B	37.	C	67.	C
8.	C	38.	B	68.	A
9.	C	39.	B	69.	D
10.	B	40.	D	70.	A
11.	A	41.	D	71.	B
12.	B	42.	B	72.	C
13.	C	43.	A	73.	D
14.	D	44.	D	74.	C
15.	B	45.	D	75.	C
16.	C	46.	D	76.	B
17.	B	47.	D	77.	B
18.	C	48.	C	78.	A
19.	D	49.	A	79.	B
20.	A	50.	C	80.	C
21.	A	51.	A	81.	B
22.	C	52.	C	82.	A
23.	A	53.	B	83.	A
24.	D	54.	B	84.	D
25.	D	55.	C	85.	A
26.	45	56.	11	86.	105
27.	60	57.	18	87.	3
28.	60	58.	1	88.	13
29.	20	59.	35	89.	3
30.	48	60.	118	90.	11