



# SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC  
Time: 3 Hours

JEE MAINS MODEL WT-10

Date: 02-08-2020  
Max. Marks: 300 M

## JEE MAIN MODEL

### MATHEMATICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 01 – 20)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 21 – 25)	Questions with Numerical Answer Type (+/- Decimal Numbers)	4	0	5	20
Total				25	100

### PHYSICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 26 – 45)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 46 – 50)	Questions with Numerical Answer Type (+/- Decimal Numbers)	4	0	5	20
Total				25	100

### CHEMISTRY

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 51 – 70)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 71 – 75)	Questions with Numerical Answer Type (+/- Decimal Numbers)	4	0	5	20
Total				25	100

**SECTION – I**  
**(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.**

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**MATHEMATICS**

**SYLLABUS: Combinations, Circles, Tangents & Normals**

1. ABCD is a convex quadrilateral and 3,4,5 and 6 points are marked on the sides AB, BC, CD and DA, respectively. The number of triangles, with vertices on different sides is  
A) 270                      B) 220                      C) 282                      D) 342
2. The number of even divisors of the number  $N = 12600$   
A) 72                      B) 54                      C) 18                      D) 45
3. Ten IIT and 2 DCE students sit in a row. The number of ways in which exactly 3 IIT students sit between 2 DCE students is  
A)  ${}^{10}C_3 \times 2 \times 3 \times 8!$       B)  $10 \times 2 \times 3 \times 8!$       C)  $5 \times 2 \times 9 \times 8!$       D)  $5 \times {}^{10}C_3$
4. If  ${}^nC_4 = {}^nC_{12}$  then greatest value of  ${}^nC_r$   
A)  ${}^nC_7$                       B)  ${}^nC_8$                       C)  ${}^nC_9$                       D)  ${}^nC_0$
5. If 20% of three element subsets of the set  $\{a_1 a_2 a_3 \dots a_n\}$  are three element subsets with an element  $a_1$ , then n is  
A) 15                      B) 16                      C) 17                      D) 18
6. There are 10 balls of different colours, In how many ways is it possible to select 7 of them so as to include the red ball?  
A) 80                      B) 82                      C) 84                      D) 90
7. The number of subsets of  $\{1, 2, \dots, 99\}$  containing at least 50 elements is  
A)  $2^{99} - 2^{49}$                       B)  $2^{97}$                       C)  $2^{99} - 2^{50}$                       D)  $2^{98}$
8. The number of ways in which 5 boys and 3 girls can be seated on a round table if a particular boy  $B_1$ , and a particular girl  $G_1$ , never sit adjacent to each other is  
A)  $6 \times 6!$                       B)  $5 \times 6!$                       C)  $7!$                       D)  $5 \times 7!$
9. If  $\sum_{i=1}^n \left( \frac{{}^nC_{i-1}}{{}^nC_i + {}^nC_{i-1}} \right) = \frac{36}{13}$  then n is equal to  
A) 10                      B) 11                      C) 12                      D) 13
10. Let  $S = \{0, 1, 2, 3, \dots, 100\}$  the number of ways of selecting  $x, y \in S$  such that  $x \neq y$ , and  $x + y = 100$  is  
A) 51                      B) 40                      C) 50                      D) 100
11. The locus of the point  $(l, m)$  if the line  $lx + my = 1$  touches the circles  $x^2 + y^2 = a^2$  is  
A)  $x^2 + y^2 = 2a^2$       B)  $2x^2 + 2y^2 = a^2$       C)  $a^2(x^2 + y^2) = 1$       D)  $a^2(x^2 + y^2) = 2$
12. Find the equation of the normal to the circle  $x^2 + y^2 - 2x = 0$  parallel to the line  $x + 2y = 3$   
A)  $x + 2y - 1 = 0$       B)  $x + 2y - 2 = 0$       C)  $x + 2y - \sqrt{3} = 0$       D)  $x + 2y + 1 = 0$
13. The circle passing through  $(1, -2)$  and touching the axis of x at  $(3, 0)$  also passes through the point  
A)  $(5, -2)$                       B)  $(-2, 5)$                       C)  $(-5, 2)$                       D)  $(2, -5)$

14. The area of the triangle formed by the tangent, normal at  $(1, \sqrt{3})$  to the circle  $x^2 + y^2 = 4$  and  $x$ -axis is  
 A)  $4\sqrt{3}$                       B)  $\frac{7}{2}\sqrt{3}$                       C)  $2\sqrt{3}$                       D)  $\frac{1}{2}\sqrt{3}$
15. A circle with centre  $(a, b)$  passes through the origin the equation of the tangent to the circle at the origin is  
 A)  $ax - by = 0$                       B)  $ax + by = 0$                       C)  $bx - ay = 0$                       D)  $bx + ay = 0$
16. If a circle, whose centre is  $(-1, 1)$  touches the straight line  $x + 2y + 12 = 0$ , then the coordinates of the point of contact is  
 A)  $\left(\frac{-7}{2}, -4\right)$                       B)  $\left(\frac{-18}{5}, \frac{-21}{5}\right)$                       C)  $(2, -7)$                       D)  $(-2, -5)$
17. The circle  $x^2 + y^2 = 4$  cuts the line joining the points  $A(1, 0)$  and  $B(3, 4)$  in two points P and Q let  $\frac{BP}{PA} = \alpha$ , and  $\frac{BQ}{QA} = \beta$  then  $\alpha$  and  $\beta$  are roots of the equation  
 A)  $3x^2 + 2x - 21 = 0$                       B)  $3x^2 + 2x + 21 = 0$   
 C)  $2x^2 + 3x - 21 = 0$                       D)  $3x^2 - 2x + 49 = 0$
18. If the line  $x + 3y = 0$  is the tangent at  $(0, 0)$  to the circle of radius 1, then the centre of one sum circle is  
 A)  $(3, 0)$                       B)  $\left(-\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}}\right)$                       C)  $\left(\frac{3}{\sqrt{10}}, \frac{-3}{\sqrt{10}}\right)$                       D)  $\left(\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}}\right)$
19. The circle  $4x^2 + 4y^2 - 12x - 12y + 9 = 0$   
 A) touches both the axes                      B) touches the  $x$ -axis only  
 C) touches the  $y$ -axis only                      D) does not touch the axes
20. The number of circles that touches all the three lines  $x + y - 1 = 0$ , and  $y + 1 = 0$  is  
 A) 2                      B) 3                      C) 4                      D) 1

## SECTION-II

### (Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme: +4 for correct answer, 0 in all other cases.**

21. Number of divisors of the form  $4n + 2 (n \geq 0)$  of the integer 240 is
22. The number of ways of distributing 15 things to 4 persons each receiving atleast two is
23. The number of 5 letter word that can be formed by using the letters of the word SARANAM is
24. The value of k if  $x^2 + y^2 + 2x - 2y + k = 0$  to touch  $x$ -axis is
25. The area bounded by the circle  $x^2 + y^2 = 1, x^2 + y^2 = 4$  and the pair of lines  $\sqrt{3(x^2 + y^2)} = 4xy$  is k then  $\tan(k) =$

**SECTION – I**  
**(SINGLE CORRECT ANSWER TYPE)**

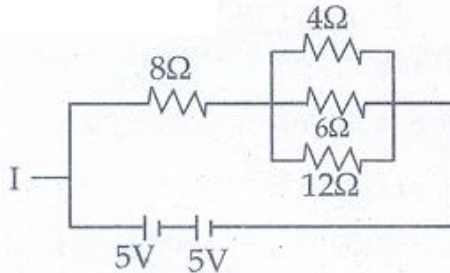
This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

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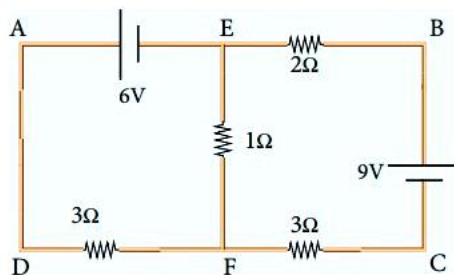
**PHYSICS**

**SYLLABUS: *Current Electricity***

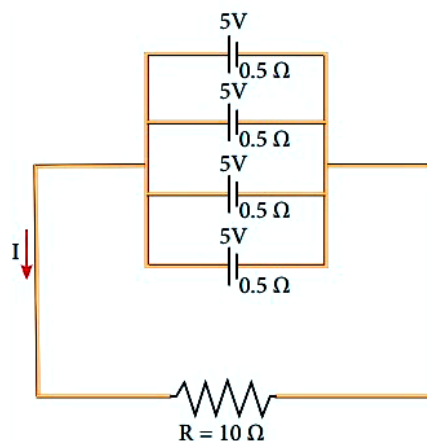
26. Two cells each of 5V are connected in series across a  $8\Omega$  resistor and three parallel resistors of  $4\Omega$ ,  $6\Omega$  and  $12\Omega$  as shown in figure. Calculate the current in 6-ohm resistor.



- A) 1A                      B) 0.5A                      C) 0.33A                      D) 0.17A
27. Calculate the current that flows in the  $1\Omega$  resistor in the following circuit.



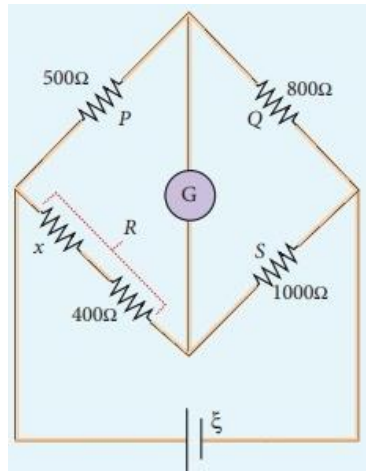
- A) the current in the 1-ohm resistor is 0.13 flows from E to F  
 B) the current in the 1-ohm resistor is 1.83 flows from F to E  
 C) the current in the 1-ohm resistor is 0.13 flows from F to E  
 D) the current in the 1-ohm resistor is 1.83 flows from E to F
28. From the given circuit



Total current (I) in ampere is ....(approximately)

- A) 0.5                      B) 0.125                      C) 3                      D) 2

29. What is the value of x when the Wheat stone's network is balanced?



- A) 225                      B) 625                      C) 400                      D) 1000

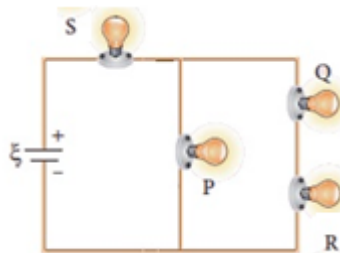
30. In a meter bridge an unknown resistance is connected and the value of resistance in the resistance box is  $10\Omega$ . The balancing length is  $l_1 = 55$  cm from left. Find the value of unknown resistance.

- A) 1.22 ohm                      B) 12.2 ohm                      C) 15 ohm                      D) 1 ohm

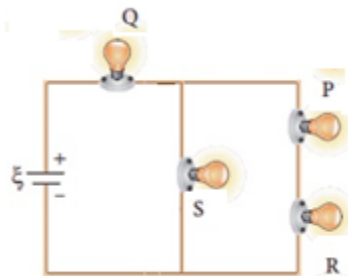
31. Four light bulbs P, Q, R, S are connected in a circuit of unknown arrangement. When each bulb is removed one at a time and replaced, the following behavior is observed.

	P	Q	R	S
P removed	*	on	on	on
Q removed	on	*	on	off
R removed	off	off	*	off
S removed	on	off	on	*

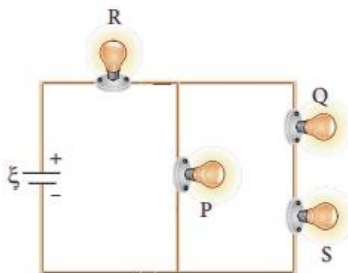
Choose the circuit diagram for these bulbs.



A)



B)



C)

D) All the above are true

32. Find the heat energy produced in a resistance of  $10\ \Omega$  when  $5\ \text{A}$  current flows through it for  $5$  minutes.

- A)  $55\ \text{kJ}$                       B)  $75\ \text{kJ}$                       C)  $100\ \text{kJ}$                       D)  $125\ \text{kJ}$

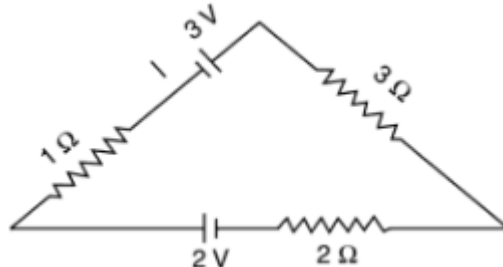
33. A potentiometer wire has a length of  $4\ \text{m}$  and resistance of  $20\ \Omega$ . It is connected in series with resistance of  $2980\ \Omega$  and a cell of emf  $4\ \text{V}$ . Calculate the potential gradient along the wire in the order of  $\times 10^{-2}\ \text{Vm}^{-1}$

- A)  $0.67$                       B)  $2.6$                       C)  $4$                       D)  $3$

34. In a potentiometer arrangement, a cell of emf  $1.25\ \text{V}$  gives a balance point at  $35\ \text{cm}$  length of the wire. If the cell is replaced by another cell and the balance point shifts to  $63\ \text{cm}$ , what is the emf of the second cell?

- A)  $2.25\ \text{V}$                       B)  $1.25\ \text{V}$                       C)  $0.25\ \text{V}$                       D)  $0.5\ \text{V}$

35. Calculate the value of  $I$  in the circuit given below.



- A)  $2.2\ \text{A}$                       B)  $3.2\ \text{A}$                       C)  $0.83\ \text{A}$                       D)  $1.99\ \text{A}$

36. The following readings are obtained in a meter bridge experiment to find the resistivity of the material of a given wire. Calculate the resistivity of the material of the wire.

Diameter of the wire =  $d = 0.36\ \text{mm}$ , length of the wire  $L = 60\ \text{cm}$ .

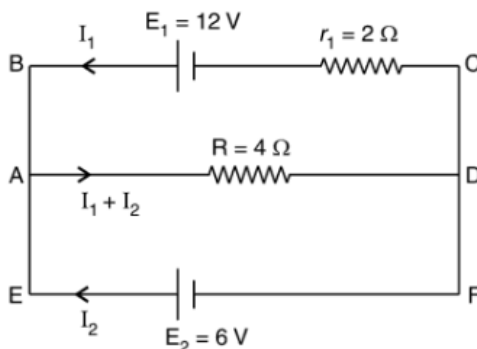
Tr. No.	Resistance in the right gap in $\Omega$	Balancing length in cm
1	3	59.0
2	6	43.0

Tr. No. : trial number

Express the answer  $\dots \times 10^{-6}\ \Omega\text{-m}$

- A)  $0.748$                       B)  $2.748$                       C)  $3.748$                       D)  $4.748$

37. In the electric network shown in the figure, use Kirchoff's rules to calculate the power consumed by the resistance  $R = 4\ \Omega$ .

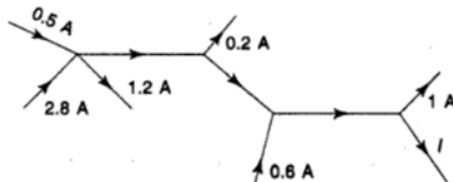


- A)  $1\ \text{W}$                       B)  $4\ \text{W}$                       C)  $9\ \text{W}$                       D)  $12\ \text{W}$

38. Six lead-acid type of secondary cells, each of emf 2.0 V and internal resistance  $0.015\Omega$ , are joined in series to provide a supply to a resistance of  $8.5\Omega$ . What are the current drawn from the supply and its terminal voltage?

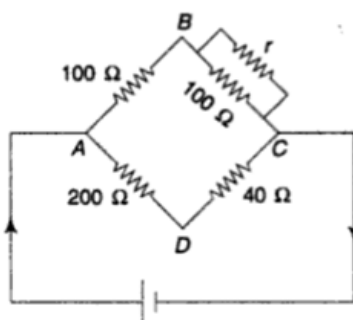
- A) 1.4A, 11.9V      B) 11.9A, 1.4V      C) 4.4A, 22.8V      D) 22.8A, 4.4V

39. Find the value of current I in the portion of a circuit shown in figure.



- A) 0.1 A      B) 0.2 A      C) 0.3 A      D) 2.1 A

40. The figure represents a balanced Wheatstone bridge. Calculate the value of r. Express the answer in ohm



- A) 20      B) 10      C) 30      D) 25

41. Twelve cells each having the same emf are connected in series and are kept in a closed box. Some of the cells are connected in reverse order. The battery is connected in series with an ammeter; an external resistance R and two cells of the same type as in the battery. The current when they aid each other is 3 ampere and is 2 ampere when the two oppose each other. How many cells are connected in reverse order?

- A) 2      B) 3      C) 4      D) 1

42. A wire connected in the left gap of a meter bridge balances a  $10\Omega$  resistance in the right gap at a point, which divides the bridge wire in the ratio 3:2. Calculate the resistance of the wire. If the length of the wire is 1 m, calculate the length of one-ohm wire.

- A) 0.99 m      B) 1.76 m      C) 0.067 m      D) 2.2 m

43. Which lamp has greater resistance: a 60 W or 100 W lamp, when connected to the same supply?

- A) 60W      B) 100W  
C) both have same resistance      D) we cannot find

44. How much current is drawn by the motor of 0.8 HP from 220 main supply?

Take 1 HP = 746 W

- A) 1.1A      B) 4.7A      C) 3.2A      D) 2.7A

45. A bulb of 100 W is operating for 8 hours a day. Find the units of energy consumed in one week. Express the answer in kWh

- A) 5.6      B) 7      C) 8      D) 2.8

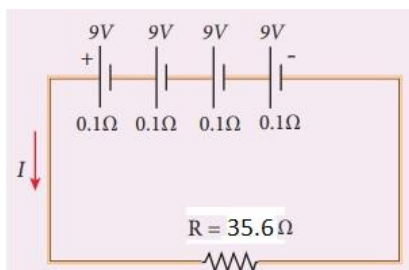
## SECTION- II

### (Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

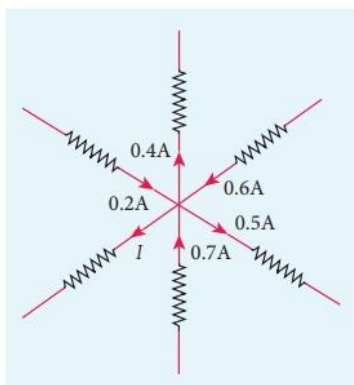
Marking scheme: +4 for correct answer, 0 in all other cases.

46. A cell supplies a current of 0.9A through a  $2\ \Omega$  resistor and a current of 0.3A through a  $7\ \Omega$  resistor. Calculate the internal resistance of the cell in ohms
47. From the given circuit,

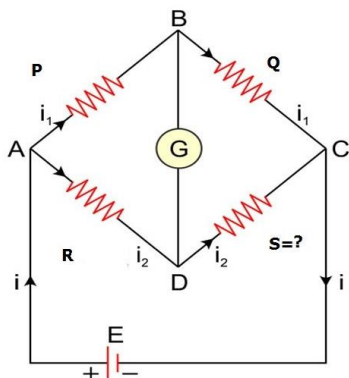


Find Total current (in ampere)

48. From the given circuit find the value of I in ampere



49. In a Wheatstone's bridge  $P = 100\ \Omega$ ,  $Q = 1000\ \Omega$  and  $R = 40\ \Omega$ . If the galvanometer shows zero deflection, determine the value of S (in ohm) is



50. In a meter bridge with a standard resistance of  $15\ \Omega$  in the right gap, the ratio of balancing length is 3:2. Find the value of the other resistance in ohm



**(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

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**CHEMISTRY**

**SYLLABUS: Solid State, Surface Chemistry Introduction**

51. Density of a crystal is given by:

- A)  $\frac{a^3 \times M}{n \times N_0}$       B)  $\frac{N_0 \times M}{n \times a^3}$       C)  $\frac{N \times M}{a^3 \times N_0}$       D)  $\frac{a^3 \times N_0}{n \times M}$

52. Due to a schottky defect, the density of the crystal is:

- A) increased      B) decreased      C) doubled      D) constant

53. Fe, Co and Ni are magnetic substances of which type

- A) paramagnetic      B) Ferromagnetic      C) Diamagnetic      D) Anti-ferromagnetic

54. The unit cell of aluminium is a cube with an edge length of 405 pm. The density of aluminium is 2.70 gm cm<sup>-3</sup>. What is the type of unit cell of aluminium crystals?

- A) Simple cubic      B) body-centred cubic  
C) face-centred cubic      D) hexagonal

55. A closed – packed structure of uniform spheres has a cubic unit cell with side 0.8nm. What is the radius of the spherical molecule?

- A) 2828 pm      B) 282.8 pm      C) 28.28 pm      D) 2.828 pm

56. For tetrahedral coordination, the ratio  $r^+/r^-$  should be:

- A) 0.155-0.225      B) 0.225-0.414      C) 0.414-0.732      D) 0.732-1

57. The radius of  $Na^+$  is 95 pm and that of  $Cl^-$  is 181 pm. The edge length of unit cell in NaCl would be (pm)

- A) 181      B) 95      C) 276      D) 552

58. Which of the following arrangements shows the schematic alignment of magnetic moments of antiferromagnetic substance?

- A)  $\uparrow \downarrow \downarrow \downarrow \downarrow \uparrow$       B)  $\uparrow \uparrow \uparrow \uparrow \uparrow \uparrow$       C)  $\uparrow \uparrow \downarrow \uparrow \uparrow \downarrow$       D)  $\uparrow \downarrow \uparrow \downarrow \uparrow \downarrow$

59. How many unit cells are present in cube shaped ideal crystal of NaCl of mass 1.00 g?

- A)  $2.57 \times 10^{21}$  unit cells      B)  $5.14 \times 10^{21}$  unit cells  
C)  $1.28 \times 10^{21}$  unit cells      D)  $1.71 \times 10^{21}$  unit cells

60. Which one of the following has both schottky and Frenkel defects

- A) AgBr      B) ZnO      C) NaCl      D) KCl

61. If we mix a pentavalent impurity in a crystal lattice of germanium, what type of semiconductor formation will occur?

- A) p-Type      B) n-Type      C) both (a) and (b)      D) none of the two

62. Non stoichiometric solid among the following

- A) MgO      B) CaO      C)  $Na_2O$       D)  $TiO$

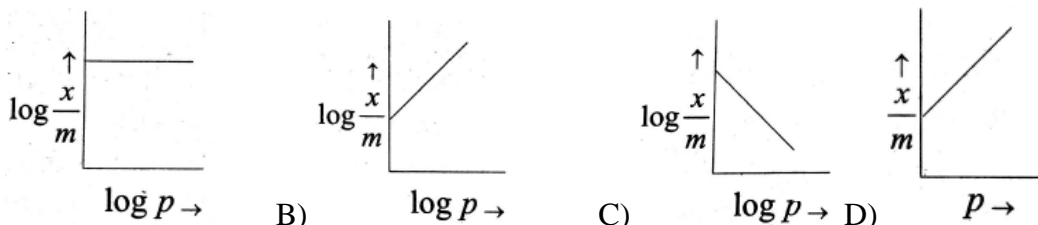
63. A metal has a body-centred cubic lattice and the length of the unit cell is  $3A^0$ . If the density is 10 gm/cc. Calculate its atomic weight.

- A) 27      B) 81      C) 40.5      D) 162

64. Langmuir's model of adsorption of a gas on a solid surface.

- A) the adsorption at a single site on the surface may involve multiple molecules at the same time  
B) the mass of gas striking a given area of surface is proportional to the pressure of the gas  
C) the mass of gas striking a given area of surface is independent of the pressure of the gas  
D) the rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

65. Which one of the following graphs represents Freundlich adsorption isotherm?



- A)  $\log \frac{x}{m}$  vs  $\log p$  → B)  $\log \frac{x}{m}$  vs  $\log p$  → C)  $\log \frac{x}{m}$  vs  $\log p$  → D)  $\frac{x}{m}$  vs  $p$  →
66. For a linear plot of  $\log (x/m)$  versus  $\log p$  in a Freundlich adsorption isotherm, which of the following statements is correct? (k and n are constants)
- A) Both k and  $1/n$  appear in the slope term      B)  $1/n$  appears as the intercept  
 C) Only  $1/n$  appears as the slope                D)  $\log (1/n)$  appears as the intercept
67. Which is not the correct statement in respect of chemisorption?
- A) Highly specific adsorption                      B) Irreversible adsorption  
 C) Multilayered adsorption                        D) High enthalpy of adsorption
68. Sorption is
- A) bulk phenomenon    B) surface phenomenon    C) both                      D) dispersion
69. Valence forces cause
- A) Chemisorption                                      B) Physical adsorption  
 C) Sorption    D) Adsorption involving multi layer
70. Which of the following is chemisorptions
- A) adsorption of  $H_2$  on Ni at high temperature    B) adsorption of  $H_2$  on charcoal  
 C) adsorption of moisture on silica gel              D) hydration of anhydrous  $CaCl_2$

## SECTION-II

### (Numerical Value Answer Type)

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Marking scheme: +4 for correct answer, 0 in all other cases.

71. In an experiment, 200 ml of 0.5M oxalic acid is shaken with 10 gms of activated charcoal and filtered. The concentration of the filtrate is reduced to 0.4M. The amount of adsorption ( $x/m$ ) is
72. A metal crystallizes in two cubic phases, fcc and bcc whose unit cell lengths are  $3.5A^{\circ}$  and  $3.0A^{\circ}$  respectively. The ratio of density of fcc and bcc is
73. The radius of  $A^+$  is 66pm and that of  $B^-$  is 140 pm. The probable type of coordination number of  $A^+$  ions is.
74. In an Adsorption experiment a graph between  $\log\left(\frac{x}{m}\right)$  versus  $\log p$  is found to be linear with a slope of  $45^{\circ}$ . The intercept on  $\log\left(\frac{x}{m}\right)$  axis was found to be 0.3010. The amount of the gas Adsorbed per gram of charcoal under a pressure of 0.5 atm will be
75. To get n-type bonded semiconductor, impurity to be added to silicon should have the following number of valency electrons.

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