Atomic Energy Central School No. 4, Rawatbhata

Class XII (Physics, Chemistry, Mathematics/Biology)

Multiple Choice Questions Examination - July (2019-20)

Name of student:_________________________Class:_______ Roll No._______

General Instructions:1. Darken the appropriate circle in the OMR answer sheet.

2. Each question carries 1 mark. There is no negative marking.

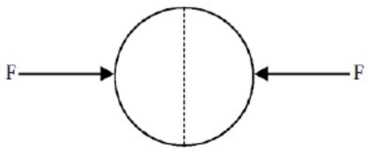
Physics

1. A half ring of radius R has a charge of λ per unit length. The field at the center is **1**

a) $2\frac{k\lambda}{R}$ b) $\frac{k\lambda}{R}$

c) zero d) $\frac{n\lambda}{R}$

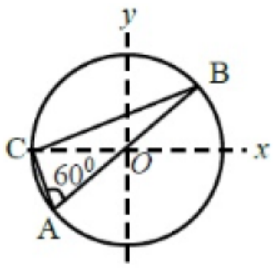
2. A uniformly charged thin spherical shell of radius R carries uniform surface charge density of σ per unit area. It is made of two hemispherical shells, held together by pressing them with force F(See figure). F is proportional to **1**



a) $\frac{\sigma^2 R^2}{\epsilon_0}$ b) $\frac{\sigma^2 R}{\epsilon_0}$

c) $\frac{1}{\epsilon_0}\frac{\sigma^2}{R^3}$ d) $\frac{1}{\epsilon_0}\frac{\sigma^2}{R}$

3. Consider a system of three charges $\frac{q}{3}, \frac{q}{3} and -\frac{2q}{3}$ placed at points A, B and C, respectively, as shown in the figure. Take O to be the centre of the circle of radius R and angle CAB = $60°$ **1**



a) The electric field at point O is $\frac{q}{4\pi\epsilon_0 R^2}$ directed along the negative x-axis

b) The magnitude of the force between the charges at C and B is $\frac{q^2}{54\pi\epsilon_0 R^2}$

c) The potential energy of the system is zero

d) The potential at point O is $\frac{q}{12\pi\epsilon_0 R}$

4. A charge Q is divided into two parts q and Q-q and separated by a distance R. The force of repulsion between them will be maximum when: **1**

a) $q = \frac{Q}{4}$ b) $q = \frac{Q}{2}$

c) $q = 4Q$ d) $q = Q$

5. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu\mathrm{C/m^2}$. **1**

a. Find the charge on the sphere.

b. What is the total electric flux leaving the surface of the sphere?

a) $1.25 \times 10^{-3}\mathrm{C}, 1.2 \times 10^{8}\mathrm{Nm^2/C}$ b) $1.55 \times 10^{-3}\mathrm{C}, 1.6 \times 10^{8}\mathrm{Nm^2/C}$

c) $1.45 \times 10^{-3}\mathrm{C}, 1.6 \times 10^{8}\mathrm{Nm^2/C}$ d) $1.35 \times 10^{-3}\mathrm{C}, 1.6 \times 10^{8}\mathrm{Nm^2/C}$

6. Six charges, each equal to + q, are placed at the corners of a regular hexagon of side a. The electric field at the point of intersection of diagonals is **1**

a) $\frac{1}{4\pi\epsilon_o} \cdot \frac{\sqrt{3}q}{2a^2}$ b) Zero

c) $\frac{1}{4\pi\epsilon_o} \cdot \frac{6q}{a^2}$ d) $\frac{1}{4\pi\epsilon_o} \cdot \frac{q}{a^2}$

7. Eight dipoles of charges of magnitude e are placed inside a cube. The total electric flux coming out of the cube will be **1**

a) $\frac{16e}{\epsilon_o}$ b) $\frac{e}{\epsilon_o}$

c) Zero d) $\frac{8e}{\epsilon_o}$

8. When a negatively charged conductor is connected to earth **1**

a) Electrons flow from the earth to the conductor b) Protons flow from the conductor to the earth

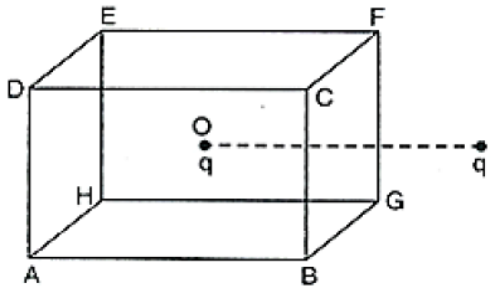
c) No charge flow occurs d) Electrons flow from the conductor to the earth

9. Under the influence of the coulomb field of charge +Q, a charge −q is moving around it in an elliptical orbit. Find out the correct statement(s). **1**

a) The linear momentum of the charge −q is constant b) The angular velocity of the charge −q is constant

c) The linear speed of the charge −q is constant d) The angular momentum of the charge −q is constant

10. A charged particle q is placed at the centre O of a cube of length L (ABCDEFGH). Another same charge q is placed at a distance L from O. Then the electric flux through ABCD is: **1**



a) $\frac{q}{2\pi\varepsilon_0 L}$ b) None of these

c) $\frac{q}{4\pi\varepsilon_0 L}$ d) $\frac{q}{3\pi\varepsilon_0 L}$

11. Consider a uniform electric field $\mathrm{E} = 3 \times 10^3 \mathrm{N/C}$. **1**

   a. What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane?

   b. What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis?

   a) $30\mathrm{Nm}^2/\mathrm{C}, 15\mathrm{Nm}^2/\mathrm{C}$ b) $20\mathrm{Nm}^2/\mathrm{C}, 15\mathrm{Nm}^2/\mathrm{C}$

   c) $40\mathrm{Nm}^2/\mathrm{C}, 15\mathrm{Nm}^2/\mathrm{C}$ d) $40\mathrm{Nm}^2/\mathrm{C}, 25\mathrm{Nm}^2/\mathrm{C}$

12. Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is $8.0 \times 10^3 \mathrm{Nm}^2/\mathrm{C}$. **1**

   1. What is the net charge inside the box?
   2. If the net outward flux through the surface of the box were zero, could you conclude that there were no charges inside the box?

   a) 0.04 μC, Yes b) 0.06 μC, Yes

   c) 0.05 μC, No d) 0.07 μC, No

13. A force of repulsion between two point charges is F, when these are at a distance 0.1 m apart. Now the point charges are replaced by conducting spheres of radii 5 cm each having the same charge as that of the respective point charges. The distance between their centres is again kept 0.1 m, then the force of repulsion will: **1**

   a) remain F b) decrease

   c) increase d) become $\frac{10F}{9}$

14. A semi-circular arc of radius 'a' is charged uniformly and the charge per unit lengths isλ. The electric field at the centre is: **1**

   a) $\frac{\lambda}{2\pi\varepsilon_0 a^2}$ b) $\frac{\lambda}{4\pi\varepsilon_0 a}$

   c) $\frac{\lambda}{2\pi\varepsilon_0 a}$ d) $\frac{\lambda^2}{2\pi\varepsilon_0 a}$

15. A metal plate of thickness half the separation between the capacitor plates of capacitance C, is inserted between the plates. The new capacitance is **1**

a) $\frac{c}{2}$

b) 0.0

c) C

d) 2C

16. To make a condenser of $16\mu F$, 1000 volts, how many condensers are needed which have written on them "$8\mu F$,, 250 volts"? **1**

a) 8.0

b) 32.0

c) 40.0

d) 2.0

17. Two identical capacitors, have the same capacitance C. One of them is charged to potential V_1 and the other to V_2. The negative ends of the capacitors are connected together. When the positive ends are also connected, the decrease in energy of the combined system is **1**

a) $\frac{1}{4}C(V_1 - V_2)^2$

b) $\frac{1}{4}C\left(V_1{}^2 + V_2{}^2\right)$

c) $\frac{1}{4}C\left(V_1{}^2 - V_2{}^2\right)$

d) $\frac{1}{4}C(V_1 + V_2)^2$

18. A $2\mu F$ capacitor C_1 is charged to a voltage 100 V and a 4 μF capacitor C_2 is charged to a voltage 50 V. The capacitors are then connected in parallel. What is the loss of energy due to parallel connection? **1**

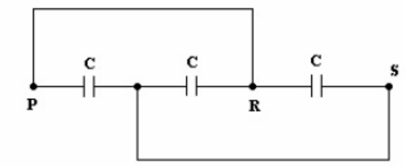
a) $1.7 \times 10^{-2} J$

b) 0.17×10^{-2} J

c) 1.7 J

d) 1.7×10^{-4}J

19. Three capacitors, each of capacitance C = 3 mF, are connected as shown in the figure. The equivalent capacitance between points P and S is **1**



a) 3 μF

b) 9 μF

c) 1 μF

d) 6 μF

20. A variable capacitor and an electroscope are connected in parallel to a battery. The reading of the electroscope would be decreased by **1**

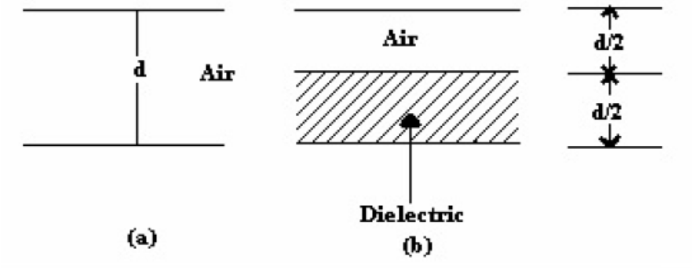
a) Decreasing the battery potential

b) Increasing the area of overlapping of the plates

c) Decreasing the distance between the plates

d) Placing a dielectric between the plates

21. A parallel plate air filled capacitor shown in the Fig. (a) has a capacitance of 2 μF. When it is half filled with a dielectric of dielectric constant k = 3 as shown in Fig. (b), its capacitance becomes **1**



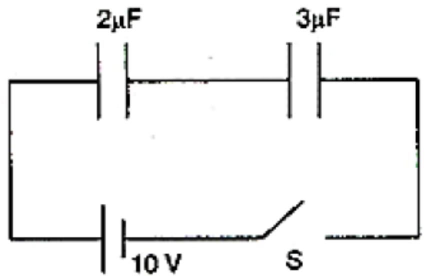
a) $\frac{1}{3}\mu F$

b) 9 μF

c) 1 μF

d) 3 μF

22. Two capacitors A and B are connected in series with a battery as shown in figure. When the switch S in closed and the two capacitors get charged fully then **1**



a) the potential difference across the plates of A is 4 V and across the plates B is 6 V

b) the ratio of charges on A and B is 3 : 2

c) the ratio of electrical energies stored in A and B is 2 : 3

d) the potential difference across the plates of A is 6 V and across the plates of B is 4 V

23. A parallel plate capacitor of value 1.77μF is to be designed using a dielectric material (dielectric constant 200, breakdown strength of $3 \times 10^{-6} Vm^{-1}$. In order to make such a capacitor, which can withstand a potential difference of 20 V across the plates, the separation d between the plates and the area A of the plates should be **1**

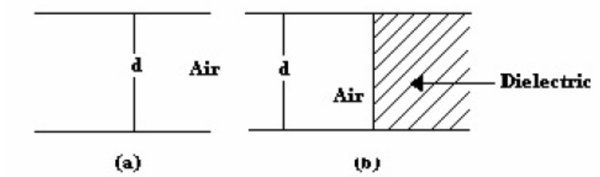
a) d = 10^{-5}m, A = 10^{-2}m^2

b) d = 10^{-4}m, A = 10^{-4}m^2

c) d = 10^{-4}m, A = 10^{-5}m^2

d) d = 10^{-6} m and A = 10^{-4}m^2

24. A parallel plate air filled capacitor shown in Fig. (a) has a capacitance of 2 μF. When it is half filled with a dielectric of dielectric constant k= 3 as shown in Fig. (b), its capacitance becomes **1**



a) 0.5 μF　　b) 3 μF

c) 4 μF　　d) 1.5 μF

25. A parallel plate capacitor of plate area A has a charge Q. The force on each plate of the capacitor is **1**

a) $\frac{2q^2}{\epsilon_o A}$　　b) zero

c) $\frac{q^2}{\epsilon_o A}$　　d) $\frac{q^2}{2\epsilon_o A}$

26. If the electric current in a lamp decreases by 5%, then the power output decreases by: **1**

a) 20%　　b) 25%

c) 10%　　d) 5%

27. A potentiometer has a uniform wire of length 10m and resistance 5 ohms. The potentiometer is connected to an external battery of emf of 10V and negligible internal resistance and a resistance of 995 ohms in series. The potential gradient along the wire is: **1**

a) 1 mV/cm　　b) 5 mV/cm

c) 1 mV/m　　d) 5 mV/m

28. Power dissipated in a resistance R through which current I is flowing is **1**

a) I^2R　　b) I^2R^2

c) IR　　d) IR^2

29. According to Ohm's law **1**

a) The electric current I flowing through a substance is proportional to the voltage V across its ends

b) The electric current I flowing through a substance is proportional to the square of voltage V across its ends

c) The electric current I flowing through a substance is inversely proportional to the voltage V across its ends

d) The electric current I flowing through a substance is independent of the voltage V across its ends

30. An electric kettle taking 3 A to 200 V brings one litre of water from 20°C to the boiling point in 10 minute. Its efficiency is: **1**

a) 93.0%　　b) 33.3%

c) 66.6%　　d) 87.7%

31. The resistance of a metallic conductor increases due to **1**

a) Change in dimensions of the conductor

b) Change in carrier density

c) Increase in the number of collisions between the carriers

d) Increase in the rate of collisions between the carriers and vibrating atoms of the conductor

32. Which can be the units of Resistivity? **1**

a) $meter \times \frac{Ampere}{Volt}$

b) $Volt \times \frac{Ampere}{meter}$

c) $\frac{Volt\ meter}{Ampere}$

d) $Volt \times Ampere$

33. The wire of the potentiometer has resistance 4 ohms and length 1 m. It is connected to a cell of e.m.f. 2 volts and internal resistance 1 ohm. The current flowing in the potentiometer is: **1**

a) 0.4 A

b) 0.1 A

c) 0.8 A

d) 0.2 A

34. Current density of a conductor is **1**

a) Is always zero

b) the net charge flowing through the area

c) the net current flowing through the area normally per unit time

d) the net charge flowing through the area per unit time

35. Direction of the conventional current **1**

a) is the direction in which negative charges move

b) is the direction in which positive charges move

c) is the direction in which no charges move

d) to the direction in which positive charges move

36. Orders of magnitude of random electron motion speed to drift speed are like **1**

a) $10^2 \mathrm{m/s}, 10^2 \mathrm{m/s}$

b) $10^3 \mathrm{m/s}, 10^{-1 \mathrm{m/s}}$

c) $10^4 \mathrm{m/s}, 10^{-2} \mathrm{m/s}$

d) $10^6 \mathrm{m/s}, 10^{-4} \mathrm{m/s}$

37. An ammeter together with an unknown resistance in series is connected across two identical batteries each of emf 1.5 V. When the batteries are connected in series, the galvanometer records a current of 1A and when the batteries are in parallel, the current is 0.6A. What is the internal resistance of each battery? **1**

a) $\frac{1}{5}\Omega$

b) $\frac{1}{3}\Omega$

c) $\frac{1}{4}\Omega$

d) $\frac{1}{2}\Omega$

38. According to Kirchhoff's Loop Rule **1**

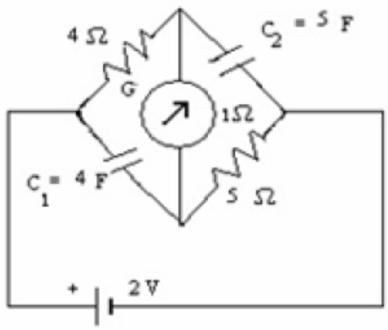
a) The absolute sum of changes in potential around any closed loop must be zero.

b) The algebraic sum of changes in potential around any closed loop must be zero.

c) The algebraic sum of changes in potential around any closed loop must be positive.

d) The algebraic sum of changes in potential around any closed loop must be negative.

39. In the circuit shown below, the cell is ideal, with emf = 2 V. The resistance of the coil of the galvanometer G is 1Ω **1**



a) 0.2 A current flows in G.

b) Potential difference cross C_2 is 1.2 V.

c) Potential difference across C_1 is 1 V.

d) No current flows in G.

40. If the number of turns, area and current through a coil is given by n, A and I respectively, then its magnetic moment will be: **1**

a) $nI/\sqrt{A}$

b) nIA

c) n^2IA

d) nIA^2

Chemistry

41. The half life periods of a reaction at initial concentration 0.1 mol/L and 0.5 mol/L are 200 s and 40 s respectively. The order of the reaction is **1**

a) 2

b) $\frac{1}{2}$

c) 0

d) 1

42. For an endothermic reaction where ΔH represents the enthalpy of the reaction in kJ/mol . The minimum value for the energy of activation will be **1**

a) Equal to ΔH

b) Zero

c) More than ΔH

d) Less than ΔH

43. If a reaction proceeds with a uniform rate throughout, the reaction is **1**

a) Third order

b) Second order

c) First order

d) Zero order

44. Rate of reaction does not remain constant throughout because **1**

a) Density of reactants keep on changing

b) Concentration of reactants keep on changing

c) Volume of reactants keep on changing

d) Temperature of reactants keep on changing

45. The rate law for the reaction is given by rate= k[RCl]. The rate for this reaction **1**

a) is unaffected by change in temperature

b) is halved by doubling the concentration of NaOH

c) is doubled by doubling the concentration of NaOH

d) is halved by half by reducing the concentration of RCl

46. Thermal decomposition of a compound is of first order. If 50% of a sample of a compound is decomposed in 120 min, the time taken for 99.9%completion is **1**

a) 1000 min

b) 399 min

c) 1200 min

d) 400 min

47. The slope in the log k vs$\frac{1}{T}$ curve is 5.42 × 10^3. The value of the activation energy is approximately

a) 104 J/mol

b) 208 J/mol

c) 104 kJ/mol

d) 104 J/mol

48. The reaction$A + 2B \rightarrow C + D$obeys the rate equation Rate = $k[A]^x[B]^y$ what would be the order of this reaction? **1**

a) x

b) x + y

c) x – y

d) Cannot be predicted with the equation

49. Which among the following statement is not true for rate constant of a reaction? **1**

a) Unit of rate constant depend upon the order of reaction

b) Rate constant depend upon the concentration of the reactants

c) Rate constant has a definite value at a particular temperature

d) Rate constant changes with temperature

50. The reaction $2\,NO + Br_2 \rightarrow 2NOBr$ follows the mechanism given below **1**

$NO + Br_2 \rightleftarrows NOBr_2(fast)$

$NOBr_2 + NO \rightarrow 2NOBr(slow)$

If the concentration of both NO and Br_2 are increased two times, the rate of reaction would become

a) 2 times

b) 8 times

c) 4 times

d) 6 times

51. The units for the rate constant for the second order reaction (concentration : mol $litre^{-1}$ time: s) are: 1

a) s^{-1} b) $mol\ litre^{-1}\ s^{-1}$

c) $mol\ litre^{-2}\ s^{-1}$ d) $mol^{-1} litre\ s^{-1}$

52. Reaction which takes place in one step is known as 1

a) Elementary reaction b) Unimolecular reaction

c) Reaction rate d) Bimolecular reaction

53. For a chemical reaction 2X + → Z, the rate of appearance of Z is 0.05 mol $L^{-1}min^{-1}$. The rate of disappearance of X will be 1

a) $0.05 mol\ L^{-1} min^{-1}$ b) 0.1 $molL^{-1}min^{-1}$

c) $0.25 mol\ L^{-1} min^{-1}$ d) 0.05mol $L^{-1}hour^{-1}$

54. Which of the following rate laws is third order overall? 1

a) rate $= K[A]^5[B]^2$ b) rate $= K[A][B]^2$

c) rate $= K[A]^3[B]^3$ d) rate $= K[A]^3[B]^1$

55. Which catalyst is used in Haber's process? 1

a) Molybdenum b) Iron

c) Platinum d) Vanadium

56. Which of the following reaction gives a colloidal sol? 1

a) $Cu + CuCl_2 \rightarrow Cu_2Cl_2$ b) $2HNO_3 + 3H_2S \rightarrow 3S + 4H_2O + 2NC$

c) $2Na + 2H_2O \rightarrow 2NaOH + H_2$ d) $MgCO_3 \rightarrow MgO + CO_2$

57. An example of autocatalysis is 1

a) Decomposition of $KClO_3$ to KCl and O_2 b) Oxidation of NO to NO_2

c) Oxidation of SO_2 to SO_3 d) Oxidation of oxalic acid by acidified $KMnO_4$

58. Which adsorption takes place at low temperature? 1

a) Chemical b) Can not say

c) Physical d) Both Physical and Chemical

59. The path of light becomes visible when it is passed through As S sol in water. (give reason) 1

a) Due to Brownian movement b) Due to micelle formation

c) Due to colour formation d) Due to Tyndall effect

60. Which is correct in case of Van der waal adsorption? 1

a) High temperature, high pressure
b) Low temperature, high pressure
c) Low temperature, low pressure
d) High temperature, low pressure

61. The adsorbent used to adsorb the dye particles in the dying industry is 1

a) Activated charcoal
b) Silica gel
c) Alum
d) Alumina gel

62. Which type of a property is the Brownian movement of colloidal solution? 1

a) Electrochemical
b) Optical
c) Mechanical
d) Electrical

63. Micelles are: 1

a) Ideal solution
b) Associated colloids
c) Adsorbed solution
d) Emulsion cum gel

64. Fog is a colloidal solution of 1

a) Liquid in gas
b) Gas in liquid
c) Solid in gas
d) Gas in gas

65. Which of the following is not exhibited by solutions? 1

a) Absorption
b) Flocculation
c) Paramagnetism
d) Tyndall effect

66. Which catalyst is used in contact process? 1

a) Molybdenum
b) Vanadium pentoxide
c) Platinum
d) Iron

67. Which of the following processes does not involve a catalyst? 1

a) Thermite process
b) Haber process
c) Oswald process
d) Contact process

68. In blast furnace, the highest temperature is in 1

a) Reduction zone
b) Slag zone
c) Fusion zone
d) Combustion zone

69. Which among the following is a chemical process? 1

a) Magnetic separation
b) Froth floatation
c) Gravity separation
d) Leaching

70. The cyanide process is used for obtaining 1

a) Ag
b) Cu
c) Zn
d) Na

71. Which solution is used as electrolyte in the extraction of aluminium metal? **1**

a) Na_3AlF_6 b) $Al_2O_3 \cdot H_2O$

c) Al_2O_3 and Na_3AlF_6 d) Al_2O_3

72. Percentage of carbon in cast iron is **1**

a) 7% b) 10%

c) 4% d) 3%

73. Cassiterite is the chief ore of **1**

a) Sn b) Al

c) Fe d) Cu

74. Heating mixture of Cu O and Cu S will give **1**

a) CuO + CuS b) Cu + SO_3

c) Cu + SO_2 d) Cu_2SO_3

75. Refining of silver is done by **1**

a) Poling b) Electrolytic refining

c) Zone refining d) Liquation

76. Cinnabar is an ore of **1**

a) Copper b) Zinc

c) Mercury d) Lead

77. An ore has impurities which are lighter than the ore. The process used for the concentration of ore is **1**

a) Froth floatation b) Hydraulic washing

c) Magnetic separation d) Leaching

78. Which among the following act as froth stabilizer? **1**

a) Sodium ethyl xanthate b) Pine oil

c) Coal tar d) Aniline

79. The reducing agent used in the blast furnace to reduce haematite to iron is **1**

a) Carbon b) Carbon dioxide

c) Silica d) Carbon monoxide

80. The second most abundant metal on earth's crust is **1**

a) Iron b) Zinc

c) Copper d) Aluminium

81. A relation R from C(complex no.) to R(real no.) is defined by xRy if |x| = y. Which of the following is correct?

a) iR1
b) (1 + i)R2
c) 3R(–3)
d) (2 + 3 i)R13

82. Let A = {a, b, c}, then the range of the relation R= {(a, b), (a, c), (b, c)} defined on A is

a) {b, c}
b) {c}
c) {a, b}
d) {a, b, c}

83. Let A = {1, 2, 3}, then the relation R = {(1, 1), (2, 2), (1, 3)} on A is

a) symmetric
b) None of these.
c) transitive
d) reflexive

84. Which of the following is not an equivalence relation on I, the set of integers: x, y

a) xRy, x + y is an even integer
b) xRy, x = y
c) xRy, x ≤ y
d) xRy, x – y is an even integer

85. Let A = {1, 2, 3}, then the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is

a) {1, 3}
b) {1, 2}
c) None of these.
d) {1, 2, 3}

86. Number of relations that can be defined on the set A = {a, b, c, d} is

a) 24
b) 4^4
c) 16
d) 2^{16}

87. A relation R in a set A is called reflexive,

a) if (a, b) ∈ R, for every a, b∈ A
b) if (a, a) ∈ R, for every a ∈ A
c) if (b, b) ∈ R, for every a∈ A
d) if (b, a) ∈ R, for every a, b ∈ A

88. Let R be the relation defined in the set A = {1, 2, 3, 4, 5, 6, 7} by R = {(a, b) : both a and b are either odd or even}. Then R is

a) non commutative relation
b) an equivalence relation
c) an empty relation
d) a universal relation

89. The maximum value of sinx + cosx is

a) 2
b) 1
c) $\sqrt{2}$
d) $\frac{1}{\sqrt{2}}$

90. $\sin 200^0 + \cos 200^0$ is

a) Positive
b) Zero
c) Zero or positive
d) Negative

91. If $\text{in}^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$. Then, $cos^{-1}x + \cos^{-1}y$ =

a) $\frac{\pi}{6}$
b) $\frac{2\pi}{3}$
c) $\frac{\pi}{3}$
d) π

92. If x > 0, then $\text{an}^{-1}x + \tan^{-1}\left(\frac{1}{x}\right)$ is equal to

a) None of these
b) $\frac{\pi}{2}$
c) tan 1
d) 1

93. $\cos\left(\cos^{-1}\left(\frac{7}{25}\right)\right) =$

a) $\frac{25}{7}$
b) None of these
c) $\frac{25}{24}$
d) $\frac{24}{25}$

94. $\tan^{-1}\frac{1}{7} + 2\tan^{-1}\frac{1}{3}$ is equal to

a) None of these
b) $\frac{\pi}{2}$
c) $\frac{\pi}{4}$
d) $\frac{3\pi}{4}$

95. The value of cos 15 - cos 30 + cos 45 - cos 60 + cos 75 is

a) 1/2
b) 2
c) 0
d) 1/4

96. if $\theta = cos^{-1}\left(\frac{1}{x}\right)$, then tan θ is equal to

a) $\frac{\sqrt{x^2-1}}{x}$
b) None of these
c) $\frac{x\sqrt{1-x^2}}{|x|}$
d) $\sqrt{x^2 - 1}$

97. If A and B are any two square matrices of the same order, then

a) adj(AB) = adj(A) adj (B)
b) $(AB)^t = B^tA^t$
c) AB = O
d) $(AB)^t = A^tB^t$

98. From the matrix equation AB = AC we can conclude B = C, provided

a) A is symmetric matrix
b) A is singular matrix
c) A is square matrix
d) A is non-singular matrix

99. If A is a square matrix, then A – A’ is a

a) symmetric matrix
b) none of these
c) skew-symmetric matrix
d) diagonal matrix

100. Let for any matrix M ,M exist. Which of the following is not true.

a) none of these
b) $(M^{-1})^{-1} = M$
c) $(M^{-1})^2 = (M^2)^{-1}$
d) $(M^{-1})^{-1} = (M^{-1})^1$

101. The order of [x y z] $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is

a) 3×1 b) 1×1

c) 1×3 d) 3×3

102. If A= $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

a) $A^2 = A$ b) $A^2 = O$

c) $A^3 = O$ d) $A^2 = I$

103. If A = $\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$, then

a) $A^2 = I$ b) $A^3 = O$

c) none of these d) $A^2 = O$

104. If P is of order 2×3 and Q is of order 3×2, then PQ is of order

a) 3×3 b) 3×2

c) 2×2 d) 2×3

105. Solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0$ is

a) { 2 , 1, 5 } b) { 2 , 0 ,1 }

c) { –3 , 1, 5 } d) { 2 , –3 ,1}

106. $\begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & 2 \\ 4^2 & 3^2 & 2^2 \end{vmatrix}$ is equal to

a) 1 b) 2

c) -2 d) 0

107. The system AX = B of n equations in n unknowns has infinitely many solutions if

a) if det.A = 0, (adj A)B$\neq$O b) det. A$\neq$0

c) if det. A$\neq$ 0, (adjA)B$\neq$ O d) if det. A = 0 , (adj A) B =O

108. The value of the determinant $\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix}$ is

a) 2(x – y)(y – z)(z – x) b) (x – y)(y – z)(z – x)

c) (x–y)(y–z)(z–x)(x+y+z) d) None of these

109. If A and B are square matrices of same order and A' denotes the transpose of A, then

a) $AB = O \Rightarrow |A| = 0$ and $|B| = 0$
b) (AB)' = A'B'
c) (AB)' = B'A'
d) $AB = O \Rightarrow A = 0$ or $B = 0$

110. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are

a) –1, – 2
b) –1 , 2
c) 1 , –2
d) 1 , 2

111. If A is a non singular matrix of order 3 , then |adj(A)| =

a) None of these
b) $|A|^8$
c) $|A|^6$
d) $|A|^9$

112. If f(x) = $\begin{vmatrix} 2\cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then, f ($\frac{\pi}{3}$) =

a) 0
b) 1
c) –1
d) 2

113. DETERMINATE IT $\begin{bmatrix} 1+x & 2 & 3 & 4 \\ 1 & 2+x & 3 & 4 \\ 1 & 2 & 3+x & 4 \\ 1 & 2 & 3 & 4+x \end{bmatrix}$

a) $(x+10)x^2$
b) None of these
c) $x^3(x+10)$
d) 0

114. Find the area of triangle with vertices (1 ,1) , (2 ,2) and (3, 3).

a) 1
b) 3
c) 0
d) 2

115. The roots of the equation det $\begin{vmatrix} 1-x & 2 & 3 \\ 0 & 2-x & 0 \\ 0 & 2 & 3-x \end{vmatrix} = 0$ are

a) None of these
b) 2 and 3
c) 1 , 2 and 3
d) 1 and 3

116. Let A = {1, 2, 3, 4, 5, 6}. Which of the following partitions of A correspond to an equivalence relation on A?
a) {1, 2,3 }, {4, 5, 6} b) {1, 2, }, {3, 4}, {2, 3, 5, 6} c) {1, 2, 3}, {3, 4, 5, 6}.
d) {1, 3}, {2, 4, 5}, {6}

117. The maximum value of sinx + cosx is a) √2 b) 1/ √2 c) 1 d)2

118. tan x is periodic with period a) π b) π/2 c) 3 π/2 d) π/3

119. The period of the function f(x) = tan3x is a) π/2 b) π c) π/3 d) 2 π

120. The number of all the possible matrices of order 2 × 2 with each entry 0, 1 or 2 is
a) 81 b)12 c) 64 d) none of these

Solution

Class 12 - Physics

MCQ Examination July (2019-20)

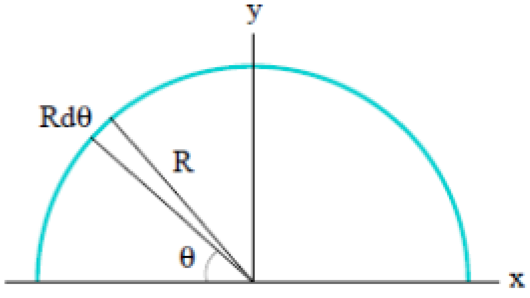
Section A

1. (a)

   $2\frac{k\lambda}{R}$

   Explanation:

   Consider a uniformly charged thin rod bent into a semicircle of radius R.

   Charge per unit length: $\lambda = \frac{Q}{\pi R}$

   Charge on slice: $dq = \lambda R d\theta$ (taken positive) Electric field generated by slice:

   $dE = \frac{k|dq|}{R^2} = \frac{k|\lambda|d\theta}{R}$ directed radially (inward for λ > 0)

   Components of dE, dE_x = dE cos θ,

   dEy = −dE sin θ

   Electric field from all slices added up: $E_x = \frac{k\lambda}{R}\int_0^{\pi} cos\theta\ d\theta$=$\frac{k\lambda}{R}[sin\pi - sin\ 0]$= 0

   E_y= $-\frac{k\lambda}{R}\int_0^{\pi} Sin\theta\ d\theta$ = $\frac{k\lambda}{R}[cos\pi - cos\ 0]$=$-\frac{2k\lambda}{R}$

2. (a)

   $\frac{\sigma^2 R^2}{\epsilon_0}$

   Explanation:

   Outward electric field at the surface of shell is $E = \frac{\sigma}{2\varepsilon_0}$ If Q is the charge on the shell and A is the area,

   than the outward pressure is $P = \frac{QE}{A} = \sigma E = \frac{\sigma^2}{2\in_0}$

   Force = PX effective area of hemispherical shell $= \frac{\sigma^2}{2\in_0} \times \pi R^2$

   So $F \propto \frac{\sigma^2}{\in_0} R^2$

3. (b)

The magnitude of the force between the charges at C and B is $\frac{q^2}{54\pi\epsilon_0 R^2}$

Explanation:

The electric field due to charges at A and B are equal and opposite, So at O the electric field is due to C only, which has a magnitude

$$E = \frac{2q}{12\pi_0 R^2} = \frac{q}{6\pi_0 R^2}$$

The potential energy of the system is not zero. Potential at O is zero and Force between B and C

$$F = \frac{\frac{q}{3}\frac{2q}{3}}{4\pi_0(2RSin60^0)^2} = \frac{q^2}{54\pi_0 R^2}$$

4. (b)

$q = \frac{Q}{2}$

Explanation:

Let, q and (Q-q) and 'r' be the separation between the charges.

The force of repulsion between them is,

$$F = \frac{K(Q-q)q}{r^2} = \frac{k}{r^2}(Qq - q^2)$$

Differentiation F w.r.t. q and setting it to zero will give us the extremum force.

$$\frac{dF}{dq} = \frac{k}{r^2}\frac{d}{dq}(Qq - q^2) = 0$$

$$=> \frac{k}{r^2}(Q - 2q) = 0$$

$$=> Q - 2q = 0$$

$$=> q = \frac{Q}{2}$$

For this value of q, the force is extremum (minimum or maximum). The force will be maximum if the second differentiation of F is less than zero.

$$\frac{d^2F}{dq^2} = \frac{-2k}{r^2} < 0$$

Thus, the force of repulsion is maximum when q = $\frac{Q}{2}$

5. (c)

$1.45 \times 10^{-3}\mathrm{C}, 1.6 \times 10^8\mathrm{Nm}^2/\mathrm{C}$

Explanation:

a. $r = \frac{d}{2} = \frac{2.4}{2} = 1.2m$

$\sigma = 80 \times 10^{-6} c/m^2$

$\sigma = \frac{q}{4\pi r^2}$

$80 \times 10^{-6} = \frac{q}{4 \times 3.14 \times (1.2)^2}$

$q = 1.45 \times 10^{-3} C$

b. $\phi = \frac{q}{\varepsilon_0} = \frac{1.45 \times 10^{-3}}{8.85 \times 10^{-12}} = 1.6 \times 10^8 Nm^2/C$

6. (b)

Zero

Explanation:

The field of opposite charges cancels each other so net electric field at centre = 0

7. (c)

Zero

Explanation:

On all the dipoles net charge = 0, hence net charge enclosed within the surface = 0. so the total electric flux coming out of the surface $\phi = \frac{q_{net}}{\varepsilon_0} = 0$

8. (d)

Electrons flow from the conductor to the earth

Explanation:

After earthing a positively charged conductor electrons flow from earth to conductor and if a negatively charged conductor is earthed then electrons flows from conductor to earth.

9. (d)

The angular momentum of the charge −q is constant

Explanation:

Since the charge –q is moving in elliptical orbit so to make its motion stable the total angular momentum of the charge is constant since it experience a centripetal force from the charge +Q so it follow the motion as the motion of earth around sun.

10. (b)

None of these

Explanation:

Electric flux for any closed surface is defined as $\oint \overrightarrow{E} \,.\, \overrightarrow{ds}$.

The flux through ABCD can be calculated, by first taking a small elemental surface and then writing the $\overrightarrow{E} \,.\, \overrightarrow{ds}$ for this element, keep in mind that electric field at the location of this element is the resultant of both the charges. It is quite obvious the flux through ABCD comes out to be non-zero because at every point of the surface, the angle between E and ds is less than 90^{o} giving a positive non-zero value for the entire surface.

The dimension of flux should be that of $\frac{q}{\epsilon_o}$, where all given options have dimensional formula for $\frac{q}{\epsilon_o l}$.

11. (a)

$30 \mathrm{Nm}^2/\mathrm{C}, 15 \mathrm{Nm}^2/\mathrm{C}$

Explanation:

1. Electric field intensity, = 3×10^3 î N/C

   Magnitude of electric field intensity, = 3×10^3 N/C

   Side of the square, s = 10 cm = 0.1 m

   Area of the square, A = s^2 = 0.01 m^2

   The plane of the square is parallel to the y-z plane.

   Hence, angle between the unit vector normal to the plane and electric field, θ = 0° Flux (Φ) through the plane is given by the relation, ϕ = $\vec{E}.\vec{A} = EA\ Cos\theta$ =$3 \times 10^3 \times 0.01 \times \cos 0°$ = 30 N m^2/C

2. Electric field intensity, = 3×10^3 î N/C

   Magnitude of electric field intensity, = 3×10^3 N/C

   Side of the square, s = 10 cm = 0.1 m

   Area of the square, A = s^2 = 0.01 m^2.

   Angle between the unit vector normal to the plane and electric field, θ = 60°

   Flux (Φ) through the plane is given by the relation, ϕ = $\vec{E}.\vec{A} = EA\ Cos\theta$ = $3 \times 10^3 \times 0.01 \times \cos 60°$ = 15 N m^2/C

12. (d)

0.07 μC, No

Explanation:

a. Net outward flux through the surface of the box, $\phi = 8.0 \times 10^3$ N m^2/C
   For a body containing net charge q,
   flux is given by the relation, $\in_0$ = Permittivity of free space = 8.854×10^{-12} $N^{-1}C^2$ m^{-2}
   We have
   $\phi = \frac{q}{\in_0} so\ q = \in_0 \phi = 8.854 \times 10^{-12} \times 8.0 \times 10^3 = 7.08 \times 10^{-8}$ = 0.07 μC Therefore, the net charge inside the box is 0.07 μC.
b. No Net flux piercing out through a body depends on the net charge contained in the body. If net flux is zero, then it can be inferred that net charge inside the body is zero. The body may have equal amount of positive and negative charges.

13. (b)

decrease

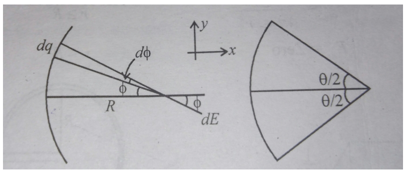
Explanation:

Since the spheres are conducting, the surface charge distribution on each sphere will be altered because of the repulsion from the charges on the other sphere. In particular, the charges on each sphere will be pushed away by the charges on the other sphere. This will cause the charges on opposite spheres to be further away from each other, and the force of repulsion to be less than in the case of a uniform surface charge distribution.

14. (c)

$\frac{\lambda}{2\pi\varepsilon_0 a}$

Explanation:



I have used the symbol R for radius in the diagram.

Letλ be the linear charge density .then a small charge element dq=λ a $d\phi$ and electric field due to this element at centre of arc dE= $\frac{dq}{4\pi\in_0 a^2}$

For every dq there exist a dq' such that y component of dE cancels out thus

$E_x = \int_{-\pi/2}^{\pi/2} dE \cos\varnothing$. Substitute for dE and dq

$E_x = \int_{-\pi/2}^{\pi/2} \frac{\lambda a \cos\varnothing d\varnothing}{4\pi \in_0 a^2}$ on solving integral.

$E_x = \frac{\lambda}{2\pi\varepsilon_0 a}$

15. (d)

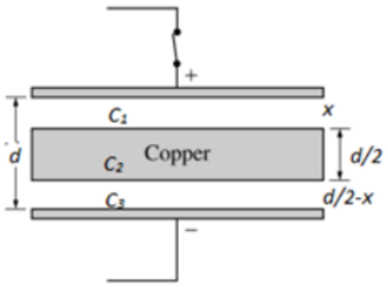
2C

Explanation:

The capacitance C of a parallel plate capacitor is given by $C = \frac{\varepsilon_0 A}{d}$

A metal plate of thickness d/2 when introduced between the plates reduces the distance between the plates to $\frac{d}{2}$. The effective capacitance becomes

$C_m = \frac{\varepsilon_0 A}{\frac{d}{2}} = \frac{2\varepsilon_0 A}{d} = 2C$



Another explanation: The system can be considered to be three capacitors C_1, C_2, and C_3 connected in series.

$C_1 = \frac{\varepsilon_0 A}{x};\ C_2 = \frac{\varepsilon_0 KA}{\frac{d}{2}};\ C_3 = \frac{\varepsilon_0 A}{\frac{d}{2} - x}$

K of a metal is infinity. $C_2 = \infty$. The equivalent capacitance

$\frac{1}{C_m} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} = \frac{x}{\varepsilon_0 A} + \frac{1}{\infty} + \frac{\frac{d}{2} - x}{\varepsilon_0 A}$

$= \frac{1}{\varepsilon_0 A}\left[x + \frac{d}{2} - x\right] = \frac{\frac{d}{2}}{\varepsilon_0 A}$

$C_m = \frac{2\varepsilon_0 A}{d} = 2C$

16. (b)

32.0

Explanation:

Each capacitor of capacitance $8\mu F$ can withstand a maximum potential of 250 V.

When equal capacitors are connected in series, the potential difference across them is equal.

If there are m capacitors in series such that the potential across each is 250 V, then, $\frac{1000}{m} = 250; m = 4$.

The equivalent capacitance of 4 capacitors connected in series is

$C_S = \frac{C}{m} = \frac{8}{4} = 2\mu F$.

To achieve a capacitance of 16, n such rows of capacitors need to be connected in parallel.

$C_{eq} = nC_S = 16\mu F;\ n = \frac{16}{C_S} = \frac{16}{2} = 8$.

To make a condenser of 16 μF, 8 rows of capacitors with each row containing 4 capacitors are to be connected.

The total number of capacitors= n×m=4×8=32.

17. (a)

$\frac{1}{4}\mathrm{C}(\mathrm{V}_1 - \mathrm{V}_2)^2$

Explanation:

The initial energy of the two capacitors $U_i = \frac{1}{2}CV_1^2 + \frac{1}{2}CV_2^2$.

The charges on the capacitors are $Q_1 = CV_1; Q_2 = CV_2$

When they are joined, they attain a common potential V. $V = \frac{\text{total charge}}{\text{total capacitance}}$

$= \frac{Q_1+Q_2}{C+C} = \frac{CV_1+CV_2}{2C} = \frac{V_1+V_2}{2}$.

Final energy $U_f = \frac{1}{2}CV^2 + \frac{1}{2}CV^2 = CV^2$ Loss of energy

$U_i - U_f = \frac{1}{2}C\left(V_1^2 + V_2^2\right) - CV^2$

$= \frac{1}{2}C\left(V_1^2 + V_2^2\right) - C\left(\frac{V_1+V_2}{2}\right)^2$

$= \frac{1}{4}C(V_1 - V_2)^2$

18. (b)

0.17×10^{-2} J

Explanation:

Explanation here:(A) Initial energy

$U_1 = \frac{1}{2}C_1V_1^2 + \frac{1}{2}C_2V_2^2$

$= \frac{1}{2}\left(2\times10^{-6}\right)(100)^2 + \frac{1}{2}\left(4\times10^{-6}\right)(50)^2$

$= 1.5 \times 10^{-2} J$

The common potential after they are connected in parallel

$V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$

$= \frac{(2 \times 10^{-6})(100) + (4 \times 10^{-6})(50)}{(2 \times 10^{-6}) + (4 \times 10^{-6})}$

$= \frac{2}{3} \times 10^2 V$

The final energy

$U_2 = \frac{1}{2}(C_1 + C_2) V^2$

$= \frac{1}{2}\left[(2 \times 10^{-6}) + (4 \times 10^{-6})\right]\left(\frac{2}{3} \times 10^2\right)^2$

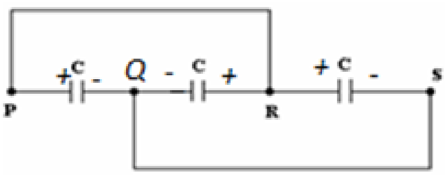
$= 1.33 \times 10^{-2} J$.

So change in energy is ΔU=U_1 - U_2=0.17×10^{-2}

19. (b)

9 μF

Explanation:



If P is at positive potential, then Q is at negative potential and R is at positive potential. The system therefore reduces to 3 capacitors in parallel. C= 9μF

20. (a) Decreasing the battery potential

Explanation:

An electroscope is a device which measures the potential difference. If it is connected in parallel to the capacitor, the potential across it will be equal to the potential across the capacitor, which is equal to the potential across the battery. On decreasing the battery potential, the potential difference across the electroscope reduces and hence the reading reduces. While the capacitor is connected to the battery, Placing a dielectric between the plates, or decreasing the distance between the plates or increasing the area of the plates will not change the potential difference across it; since it will always remain equal to the potential difference maintained by the battery. In the cases B, C and D, The capacitance of the capacitor , however increases ; but this increase happens due to increase in the charge stored in the capacitor while the potential remains constant.

21. (d)

3 μF

Explanation:

The capacitance of the first capacitor $C=\frac{\varepsilon_0 A}{d}=2\mu\text{F}$ The second capacitor is considered to be made of two capacitors C_1 (air filled) and C_2 (dielectric) connected in series.

$C_1=\frac{\varepsilon_0 A}{\frac{d}{2}}=2C=4\mu F;$

$C_2=\frac{K\varepsilon_0 A}{\frac{d}{2}}=2KC=12\mu F$

The equivalent capacitance

$C_1=\frac{\varepsilon_0 A}{\frac{d}{2}}=2C=4\mu F;$

$C_2=\frac{K\varepsilon_0 A}{\frac{d}{2}}=2KC=12\mu F$

22. (d)

the potential difference across the plates of A is 6 V and across the plates of B is 4 V

Explanation:

the potential difference across the plates of A is 6 V and across the plates of B is 4 V

23. (a)

d = 10^{-5}m, A = 10^{-2}m^2

Explanation:

The capacitance of a parallel plate capacitor of area A, plate separation d with a dielectric of dielectric constant K is $C=\frac{\varepsilon_0 KA}{d}$.

The ratio $\frac{A}{d}=\frac{C}{\varepsilon_0 K}=\frac{1.77\times10^{-6}}{8.85\times10^{-12}\times200}=10^3$.

The minimum plate separation d' for which the capacitor will not breakdown is found using $E=\frac{V}{d'}$

where E is the breakdown strength and V is the maximum potential the capacitor can withstand.

$d'=\frac{V}{E}=\frac{20}{3\times10^6}=6.67\times10^{-6}m$.

The plate separation has to be greater than $6.67 \times 10^{-6} m$

therefore only option A satisfies the condition $\frac{A}{d} = \frac{10^{-2}}{10^{-5}} = 10^3$

24. (c)

$4\ \mu$F

Explanation:

The capacitance of the first capacitor $C = \frac{\varepsilon_0 A}{d} = 2\mu$F

The second capacitor is considered to be made of two capacitors C_1 (air filled) and C_2 (dielectric) connected in parallel.

$$C_1 = \frac{\varepsilon_0 \frac{A}{2}}{d} = \frac{C}{2} = 1\mu F;\ C_2 = \frac{K\varepsilon_0 \frac{A}{2}}{d} = \frac{KC}{2} = 3\mu F$$
$$C_{eq} = C_1 + C_2 = 1\mu F + 3\mu F = 4\mu F$$

25. (d)

$\frac{q^2}{2\epsilon_o A}$

Explanation:

Force between two plates of the capacitor

F = uA where u is

The energy density $u = \frac{1}{2}\varepsilon_0 E^2$

The electric field $E = \frac{\sigma}{\varepsilon_0}$

and the charge density $\sigma = \frac{q}{A}$

$$F = \frac{1}{2}\varepsilon_0 E^2 A = \frac{1}{2}\varepsilon_0 \left(\frac{\sigma}{\varepsilon_0}\right)^2 A = \frac{1}{2}\frac{\sigma^2 A}{\varepsilon_0} = \frac{1}{2}\left(\frac{q}{A}\right)^2 \frac{A}{\varepsilon_0} = \frac{q^2}{2A\varepsilon_0}$$

26. (c)

10%

Explanation:

Let original Current In lamp = I

Resistance of Lamp = R

Then power P = I^2R

According to question,

New Current $I_n = I - I \times \frac{5}{100} = \frac{19}{20} I$

Resistance = R

New power $P_n = I_n^2 R = (\frac{19}{20} I)^2 R = \frac{361}{400} I^2 R$

Power decrease = $I^2R - \frac{361}{400}I^2R = \frac{39}{400}I^2R$

% Decrease = $\frac{change\ in\ power}{original\ power} \times 100$

$= \frac{\frac{39}{400}I^2R}{I^2R} \times 100 = \frac{39I^2R}{400I^2R} \times 100$

$= \frac{39}{4} = 9.75\% \approx 10\%$

27. (d)

5 mV/m

Explanation:

The total resistance is the sum of the resistance of the potentiometer and the external resistance.

R = R_{pot} + R_{ext} = 5 + 995 = 1000 ohms .

The current through the potentiometer wire $I = \frac{E}{R} = \frac{10}{1000} = 0.01A$ I = E/R = 10/1000 = 0.01A.

The potential drop across the potentiometer wire is

$V = I \times R_{pot}$

$\Rightarrow V = 0.01 \times 5$

V = 0.05V

The potential gradient = (potential drop across the potentiometer wire)/ length of the potentiometer wire)

$= \frac{0.05}{10}$

$= 5 \times 10^{-3} V/m$

= 5 mV/m

28. (a)

I^2R

Explanation:

The power dissipated

$P = V \times I$

Since $V = IR$

$P = I^2R$

29. (a)

The electric current I flowing through a substance is proportional to the voltage V across its ends

Explanation:

Ohm's law states I is proportional to V. This holds good at steady temperatures and for the flow of constant current.

30. (a)

93.0%

Explanation:

V = 200 Volt I = 3 A time= 10 minute = 600 sec

The electric energy (input energy) = VIt = $200 \times 3 \times 600 = 360000$joule

m = 1 l = 1000 g = 1 kg sp. heat of water = 4186 j/kg/^{0}C $\triangle$T = 100 -20 = 80^{0}C

Heat energy (output energy) = mc$\triangle$T = $1 \times 4186 \times 80 = 334880$joule

efficiency = $= \frac{output\ energy}{input\ energy} \times 100$ = $\frac{334880}{360000} \times 100 \ = 93.0$%

31. (d)

Increase in the rate of collisions between the carriers and vibrating atoms of the conductor

Explanation:

When temperature increases, the thermal speed of the electrons increases as well as, the amplitude of vibration of the positive ions inside the metal conductor also increase, about their mean positions. Thus, the collisions between the electrons and the positive metal ions become more frequent and this decreases the relaxation time, t, leading to an increase in the resistivity of the conductor.

32. (c)

$\frac{Volt\ meter}{Ampere}$

Explanation:

$\because$ Resistance $R = \rho \frac{L}{A}$

Where ρ is resistivity, L is length and A is area.

$\Rightarrow \rho = R\frac{A}{L}$

also $R = \frac{V}{I}$

$\therefore \rho = \frac{V \times A}{I \times L}$

and in units,

$\rho = \frac{(Volts)\times(meter)^2}{(Ampere)\times(meter)}$

$\Rightarrow \rho = \frac{Volt\ meter}{Ampere}$

33. (a)

0.4 A

Explanation:

If the battery has an e.m.f E, resistance of the potentiometer is R and the internal resistance of the battery is r, then the current I flowing in the potentiometer wire is given as

$I = \frac{E}{(R+r)}$

$I = \frac{2}{(4+1)}$

I = 0.4 A

34. (c)

the net current flowing through the area normally per unit time

Explanation:

Current density J = I/A

In electromagnetism, current density is the electric current per unit area of cross section. It is a vector and has a direction along the area vector.

35. (b)

is the direction in which positive charges move

Explanation:

Current flows in a conductor due to the flow of negatively charged electrons. However, the direction of conventional current is taken to be opposite to the direction of flow of electrons. It can therefore be considered as the direction in which positive charges move.

36. (d)

$10^6 \mathrm{m/s}, 10^{-4} \mathrm{m/s}$

Explanation:

The random velocities of electrons is of the order 10^5 to 10^6 m/s, while the drift velocities are of the order 0.1mm/s (10^{-4}m/s)

37. (b)

$\frac{1}{3}\Omega$

Explanation:

Given,

$E_1 = E_2 = 1.5$

Let internal resistance of battery be r. If batteries are connected in series then,

$E = E_1 + E_2 = 3\ V$

T_{total} = 2r

Now,

$I = \frac{E}{(R+2r)}$

$\Rightarrow 1 = \frac{3}{(R+2r)}$

R + 2r = 3 ..... (i)

If batteries are connected in parallel

E = 1.5V

$\frac{1}{T_{total}} = \frac{1}{r} + \frac{1}{r}$

$T_{total} = \frac{r}{2}$

and,

$0.6 = \frac{1.5}{\left(R+\frac{r}{2}\right)}$

$\Rightarrow 0.6R + 0.3r = 1.5$....... (ii)

on solving equation (i) and (ii)

$r = \frac{1}{3}\Omega$

38. (b)

The algebraic sum of changes in potential around any closed loop must be zero.

Explanation:

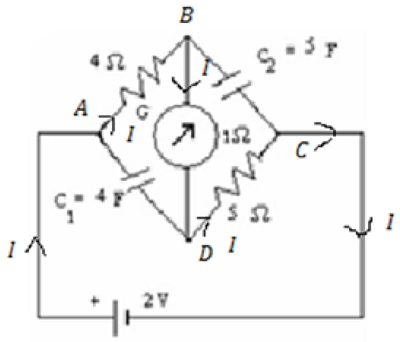
Kirchhoff's loop rule is based on the principle of conservation of energy. Since work done in transporting a charge in a closed loop is zero. The algebraic sum (since potential differences can be both positive and negative) of potential differences around any closed loop is always zero.

39. (a)

0.2 A current flows in G.

Explanation:

In steady state, no current flows through the capacitors.



(B) The current flows along ABGDCA. The resistances 4Ω, 1 Ω and 5 Ω are in series. Total resistance of the circuit = R= 4+1+5=10 Ω. Current I = V/R= 2/10 = 0.2 A. The current through the galvanometer is 0.2 A

40. (b)

nIA

Explanation:

Magnetic moment is defined as the product of total current and area of loop

$M = n \times I \times A$

Solution

Class 12 - Chemistry

MCQ July

Section A

41. (a)
    2

    Explanation:
    As initial concentration is increased half life is decreasing so order of reaction is 2.
    for second order reaction, $rate\ \alpha\ \frac{1}{[R]}$
42. (c)
    More than ΔH

    Explanation:
    $\triangle H = +ve$ for endothermic reaction
    , therefore, $E_a > \Delta H$
43. (d)
    Zero order

    Explanation:
    Uniform Rate of reaction is independent of concentration of reactants.
44. (b)
    Concentration of reactants keep on changing

    Explanation:
    Rate of reaction is dependent on concentration of reactants.if concentration of reactants change then rate of reaction become non-uniform.
45. (d)
    is halved by half by reducing the concentration of RCl

    Explanation:

since rate of reaction = k[RCl]^1

so if conc. of RCl is halfed the rate of reaction will also become half.

46. (c)

1200 min

Explanation:

$t_{99.9} = 10 \times t_{1/2}$

detail:

here, $k = \frac{0.693}{120}$

also, $t = \frac{2.303 \times 120}{0.693} \log 10^3 = \frac{2.303 \times 120 \times 3}{0.693} \log 10$

$\Rightarrow t = \frac{2.303 \times 120 \times 3 \times 1}{0.693} = 1196.36 \simeq 1200$

47. (c)

104 kJ/mol

Explanation:

$lnK = lnA - \frac{Ea}{RT}$

on comparing with y=mx+c

$slope = \frac{E_a}{2.303R}$

$E_a = 5.42 \times 10^3 \times 2.303 \times 8.314$

$E_a = 103.7KJ/mol$

48. (b)

x + y

Explanation:

Order of reaction with respect to A is x and w.r.t to B is y so total order of reaction is x+y.

49. (b)

Rate constant depend upon the concentration of the reactants

Explanation:

Rate constant is independent of concentration of reactant for a particular reaction.

50. (b)

8 times

Explanation:

1. $NO + Br_2 \leftrightarrow NOBr_2[Fast, revers.]$
2. $NOBr_2 + NO \rightarrow 2NOBr[Slow, RDS]$

$\Rightarrow Rate = Rate_2 = k_2[NO][NOBr_2]$

$\rightarrow Rate1 = Rate_{-1} \rightarrow k_1[NO][Br_2]= k_{-1}[NOBr_2]$

$\rightarrow [NOBr_2] = (k_1/k_{-1})[NO][Br_2]$

$\Rightarrow Rate = k_2[NO][NOBr_2]= k_2[NO](k_1/k_{-1})[NO][Br_2]$

$\Rightarrow Rate = (k_2k_1/k_{-1})[NO]^{2[}Br_2]= k[NO]^2[Br_2]$

Rate=$k[NO]^2[Br_2]$, since rate of reaction w.r.t [NO] is second order and w.r.t [Br] is first order, then rate of reaction become 8times when conc. of [NO] and [Br] is doubled.

rate' = $k[2NO]^2$ $[2Br_2]$

rate' =8 × Rate

51. (d)

$mol^{-1}litre\ s^{-1}$

Explanation:

unit of rate constant for nth order of reaction are:

unit of k for nth order = $(molL^{-1})^{1-n}$ s^{-1}

put n=2 for second order reaction.

52. (a)

Elementary reaction

Explanation:

An elementary reaction is a chemical reaction in which one or more chemical species react directly to form products in a single reaction step and with a single transition state

53. (b)

0.1 $molL^{-1}min^{-1}$

Explanation:

$2X + Y \rightarrow Z$

$rate = -\frac{1}{2}\frac{d[X]}{dt} = -\frac{d[Y]}{dt} = \frac{d[Z]}{dt}$

$\frac{d[X]}{dt} = 2\frac{d[Z]}{dt} = 2 \times 0.05 = 0.1 mol\ L^{-1}\ min^{-1}$

54. (b)

rate $= K[A][B]^2$

Explanation:

rate $= K[A][B]^2$

since rate of given reaction is first order wrt A reactant and second order wrt B reactant.

order of reaction is sum of powers of each reactant in rate law expression.

so, order of reaction=1+2=3

55. (b)

Iron

Explanation:

Finely divided Iron (Fe) is used as a catalyst as the surface area of small particles is much larger than normal crystal. Along with Fe a promoter (substance that activates a catalyst) Molybdenum (Mo) is used.

$N_2 + 3H_2 \xrightarrow[Mo]{Fe} 2NH_3$

According to Le Chatelier's principle, high pressure and temperature promote this reaction in forward direction.

Also, Iron oxide (Fe_2O_3) along with potassium oxide and alumina is used for Haber's process.

56. (b)

$2HNO_3\ +\ 3H_2S \rightarrow 3S\ +\ 4H_2O\ +\ 2NO$

Explanation:

It is a redox reaction where sulphur is oxidized and nitrogen is reduced and result will be a colloidal solution.

57. (d)

Oxidation of oxalic acid by acidified $KMnO_4$

Explanation:

Autocatalysis occurs when the product of a reaction serves as a catalyst for the reaction.

58. (c)

Physical

Explanation:

Physical adsorption is favoured at low temperature because it involves only vanderwall interactions between adsorbate and adsorbent.

59. (d)

Due to Tyndall effect

Explanation:

This is because of tyndall effect caused by the scattering of light by colloidal particles of As_2S_3.

60. (b)

Low temperature, high pressure

Explanation:

Physisorption is favoured only at low temperature and high pressure.

61. (c)

Alum

Explanation:

Alum is used in dying industries.

62. (c)

Mechanical

Explanation:

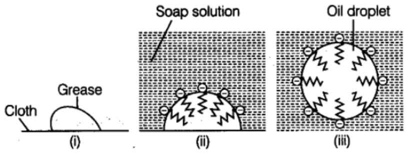
Movement is always a mechanical property.

63. (b)

Associated colloids

Explanation:

Micelles are chemical structures formed with both hydrophilic (they'll mix into water) and hydrophobic (they don't mix into water). Also called as Associated colloids. In the general case, micelles are formed when there is an ideal temperature in the medium (called the Kraft temperature) and a certain concentration of electrolytes (called the CMC: Critical Micelle Concentration) in the medium.



i. Grease or oil on surface of cloth.
ii. Stearate ions arranged around the grease or oil droplet.
iii. Grease or oil droplet surrounded by stearate ions (ionic micelle formed).

64. (a)

Liquid in gas

Explanation:

Dispersed phase is liquid, dispersion medium is gas.

65. (b)

Flocculation

Explanation:

Due to very less size of colloidal solutions, they do not exhibit flocculation. When a sol is colloidally unstable then the formation of aggregates is called flocculation.

66. (b)

Vanadium pentoxide

Explanation:

V_2O_5 is used as catalyst in contact process .

67. (a)

Thermite process

Explanation:

Thermite process doesn't require a catalyst. It can easily proceed without the help of catalyst.

68. (d)

Combustion zone

Explanation:

Combustion zone maintains the highest temperature around 1775 K.

e.g. extraction of Fe

69. (d)

Leaching

Explanation:

Leaching is a process in which ore is digested with a solvent to form a soluble complex.

Example: Leaching of aluminia from bauxite.

70. (a)

Ag

Explanation:

Ag is obtained by Leaching process by using dil. NaCN/KCN followed by replacement to give the pure metal.

71. (c)

Al_2O_3 and Na_3AlF_6

Explanation:

Al_2O_3 and Na_3AlF_6 (molten solution). Aluminium oxide has a very high melting point (over 2,000°C), so it would be expensive to melt it. Instead, it is dissolved in molten cryolite, an aluminium compound with a lower melting point than aluminium oxide. The use of cryolite reduces some of the energy costs involved in extracting aluminium.

72. (d)

3%

Explanation:

Cast iron is made by melting pig iron with scrap iron and coke using hot air blast. It has 3% of carbon content and is extremely hard and brittle.

73. (a)

Sn

Explanation:

Cassiterite is a tin dioxide mineral. It is generally opaque, but it is translucent in thin crystals. Its luster and multiple crystal faces produce a desirable gem. Cassiterite has been the chief tin ore throughout ancient history and remains the most important source of tin today.

74. (c)

$Cu + SO_2$

Explanation:

This auto reduction reaction gives metallic copper and sulphur dioxide.

$2Cu_2O + Cu_2S \rightarrow 6\ Cu + SO_2$

75. (b)

Electrolytic refining

Explanation:

In this method, the impure metal acts as anode. A strip of same pure metal is used as cathode. A salt of metal is made an electrolyte. On passing electricity through the solution, the pure metal moves towards the cathode, and impurities present in the anode settle down at the bottom as anode mud.

76. (c)

Mercury

Explanation:

HgS is brick red form of sulphide ore of Hg from which it can be profitably extracted. It resembles quartz in symmetry.

77. (b)

Hydraulic washing

Explanation:

This is hydraulic washing or gravity separation. Here when stream of water is passed it takes away all the lighter impurities with it and the heavier ore particles are left behind.

78. (d)

Aniline

Explanation:

During froth flotation, substances are used to stabilize the froth so that it can be easily skimmed off and purified. Aniline and cresols are froth stabilizers.

79. (d)

Carbon monoxide

Explanation:

CO is used as reducing agent in blast furnace to get iron at such a high temperature.

$3\ Fe_2O_3 + CO \rightarrow 2\ Fe_3O_4 + CO_2$

$Fe_3O_4 + 4\ CO \rightarrow 3Fe + 4\ CO_2$

80. (a)

Iron

Explanation:

Iron is 2nd most abundant metal in earth's crust around 5 %.

Solution

Class 12 - Mathematics

MCQ Test

Section A

81. (a)

    iR1

    Explanation:

    As $x \in C$ i.e. x is a complex no., then $|i| = \sqrt{0^2 + 1^2} = 1$.

82. (a)

    {b, c}

    Explanation:

    Since the range is represented by the y- coordinate of the ordered pair (x , y). Therefore, range of the given relation is { b , c }.

83. (c)

    transitive

    Explanation:

    The given relation is not reflexive, as (3,3)$\notin$R, The given relation is not symmetric, as (1,3)$\in$ R, but (3,1) $\notin$R, The given relation is transitive as (1,1))$\in$ R and (1,3))$\in$ R.

84. (c)

    xRy, x ≤ y

    Explanation:

    If R is a relation defined by xRy: if $x \leqslant y,$ then R is reflexive and transitive. But, it is not symmetric. Hence, R is not an equivalence relation.

85. (b)

    {1, 2}

    Explanation:

    Since the domain is represented by the x- coordinate of the ordered pair (x , y).Therefore, domain of the given relation is { 1 , 2 }.

86. (d)

2^{16}

Explanation:

No. of elements in the set A = 4 . Therefore , the no. of elements in $A \times A = 4 \times 4 = 16.$ As, the no. of relations in $A \times A$ = no. of subsets of$A \times A = 2^{16}$.

87. (b)

if (a, a) ∈ R, for every a ∈ A

Explanation:

A relation R on a non empty set A is said to be reflexive if x Rx for all x ∈ R , Therefore , R is reflexive.

88. (b)

an equivalence relation

Explanation:

Consider any a ,b , c ∈A .

1. Since both a and a must be either even or odd, so (a , a) ∈R ⇒R is reflexive.
2. Let (a ,b) ∈ R ⇒ both a and b must be either even or odd, ⇒ both b and a must be either even or odd, ⇒ (b ,a) ∈R .Thus , (a ,b) ∈R ⇒ (b ,a) ∈R ⇒R is symmetric.
3. Let (a ,b) ∈R and (b ,c) ∈R ⇒ both a and b must be either even or odd, also ,both b and c must be either even or odd, ⇒ all elements a, b and c must be either even or odd, ⇒ (a ,c) ∈ R . Thus , (a ,b) ∈ R ⇒ (b ,c) ∈ R ⇒ (a ,c) ∈ R ⇒R is transitive.

89. (c)

$\sqrt{2}$

Explanation:

Since, range of sine and cosine function is [-1,1]. But, sine is increasing function and cosine is decreasing function the highest that both together attain is 45^0

$$\left(\frac{1}{\sqrt{2}}\right) + \left(\frac{1}{\sqrt{2}}\right) = \sqrt{2}$$

90. (d)

Negative

Explanation:

Because, both $sin200^0 \;\; and \;\; cos200^0$ lies in 3rd quadrant. In 3rd quadrant, values of both sine and cosine functions are negative.

91. (c)

$\frac{\pi}{3}$

Explanation:

$\sin^{-1}x + \cos^{-1}y \ = \ \frac{2\pi}{3}$

$\Rightarrow \frac{\pi}{2} - \cos^{-1}x + \frac{\pi}{2} - \cos^{-1}y = \frac{2\pi}{3}$

$\Rightarrow \pi - \left(\cos^{-1}x + \cos^{-1}y\right) = \frac{2\pi}{3}$

$\therefore \ \left(\cos^{-1}x + \cos^{-1}y\right) = \pi - \frac{2\pi}{3} \ \ = \frac{\pi}{3}$

92. (b)

$\frac{\pi}{2}$

Explanation:

$\tan^{-1}x + \tan^{-1}\left(\frac{1}{x}\right)$

$\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$

93. (b)

None of these

Explanation:

We know that $cos : [0, 1] \to [-1, 1]$is bijective function

$\Rightarrow cos^{-1} : [-1, 1] \to [0, 1]$is inverse of cos function.

$.\Rightarrow \cos(\cos^{-1}x) \ = x$ when $x \in [-1, 1]$

here, $cos(\cos^{-1}\frac{7}{25}) \ = \frac{7}{25}, \qquad \frac{7}{25} \ \in [-1, 1\,]$

94. (c)

$\frac{\pi}{4}$

Explanation:

$\tan^{-1}\frac{1}{7} + 2\tan^{-1}\frac{3}{4} \Rightarrow \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{2.\frac{1}{3}}{1-\left(\frac{1}{3}\right)^2}$

$$= \tan^{-1}\frac{1}{7} + 2\tan^{-1}\frac{3}{4} \Rightarrow \tan^{-1}\frac{\frac{1}{7}+\frac{3}{4}}{1-\frac{1}{7}.\frac{3}{4}} \Rightarrow \tan^{-1}(1) = \frac{\pi}{4}$$

95. (a)

1/2

Explanation:

$$\cos^2 15^o - \cos^2 30^o + \cos^2 45^o - \cos^2 60^o + \cos^2 75^o$$
$$= \sin^2 75^o + \cos^2 75^o + \cos^2 45^o - \cos^2 60^o + \cos^2 30^o$$
$$= 1 + \left(\frac{1}{\sqrt{2}}\right)^2 - \left(\frac{1}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{2}$$

96. (a)

$\frac{\sqrt{x^2-1}}{x}$

Explanation:

if $\theta = \cos^{-1}\left(\frac{1}{x}\right)$

$$\Rightarrow \cos\theta = \frac{1}{x} = \frac{Base}{Hyp.} \Rightarrow \tan\theta = \frac{Perp.}{Base} = \frac{\sqrt{x^2-1}}{x}$$

97. (b)

$(AB)^t = B^tA^t$

Explanation:

By the property of transpose ,(AB)’ = B’A’

98. (d)

A is non-singular matrix

Explanation:

Here, only non- singular matrices obey cancellation laws.

99. (c)

skew-symmetric matrix

Explanation:

The difference of a matrix A and its transpose is always skew – symmetric.

100. (d)

$(M^{-1})^{-1} = (M^{-1})^1$

Explanation:

Clearly , $(M^{-1})^{-1} = (M^{-1})^{1}$ is not true.

101. (b)

1×1

Explanation:

$[xyz]_{1\ x\ 3} \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}_{3\times3} \begin{bmatrix} x \\ y \\ z \end{bmatrix}_{3\times1}$ = $[A]_{1\ \times\ 1}$. (where ; matrix A denotes the product of three given matrices.)

102. (c)

$A^3 = O$

Explanation:

If any row or column of a square matrix is 0, then its product with itself is always a zero matrix.

103. (d)

$A^2 = O$

Explanation:

If any row or column of a square matrix is 0, then its product with itself is always a zero matrix.

104. (c)

$2\ \times\ 2$

Explanation:

Here, matrix P is of order $2\ \times\ 3$ and matrix Q is of order $3\ \times\ 2$, then, the product PQ is defined only when : no. of columns in P = no. of rows in Q. And the order of resulting matrix is given by : rows in P x columns in Q.

105. (d)

{ 2 , –3 ,1}

Explanation:

Expanding along R_1

$[x(-3x(x+2) - 2x(x-3)] + 6[2(x +2) + 3(x - 3)] -1 (4x - 9x) = 0$

$\Rightarrow -5x^3 + 35 x - 30 = 0$

$\Rightarrow (x - 1)(x - 2)(x + 3) = 0 \Rightarrow x = 1, 2, -3$

106. (c)

-2

Explanation:

$$\begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & 2 \\ 4^2 & 3^2 & 2^2 \end{vmatrix} \Rightarrow \begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & 2 \\ 16 & 9 & 4 \end{vmatrix}$$

Apply, $C_1 \to C_1 - C_3$, $C_2 \to C_2 - C_3$

$$\begin{vmatrix} 0 & 0 & 1 \\ 2 & 1 & 2 \\ 12 & 5 & 4 \end{vmatrix} = 10 - 12 = -2$$

107. (d)

if det. A = 0 , (adj A) B =O

Explanation:

If det. A = 0, (adj A) B =O$\Rightarrow$ The system AX = B of n equations in n unknowns may be consistent with infinitely many solutions or it may be inconsistent.

108. (c)

(x–y)(y–z)(z–x)(x+y+z)

Explanation:

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix}$$

Apply, $R_1 \to R_1 - R_2$, $R_2 \to R_2 - R_3$

$$\begin{vmatrix} 0 & x-y & x^3-y^3 \\ 0 & y-z & y^3-z^3 \\ 1 & z & z^3 \end{vmatrix}$$

$$\Rightarrow (x-y)(y-z) \begin{vmatrix} 0 & 1 & x^2+y^2+xy \\ 0 & 1 & y^2+z^2+yz \\ 1 & z & z^3 \end{vmatrix}$$

$= (x - y)(y - z)(y^2 + z^2 + yz - x^2 - y^2 - xy)$

$= (x - y)(y - z)(z - x)(x + y + z)$

109. (c)

(AB)’ = B’A’

Explanation:

By the property of transpose of a matrix, (AB)’ = B’A’.

110. (b)

–1 , 2

Explanation:

$$\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$$

Apply, $R_3 \rightarrow R_3 - R_1$, $R_2 \rightarrow R_2 - R_1$,

$$\Rightarrow \begin{vmatrix} 1 & 4 & 20 \\ 0 & -6 & -15 \\ 0 & 2x-4 & 5x^2-20 \end{vmatrix} = 0$$

$\Rightarrow -6(5x^2 - 20) + 15(2x - 4) = 0$

$\Rightarrow (x - 2)(x + 1) = 0 \Rightarrow x = 2 , -1.$

111. (c)

$|A|^6$

Explanation:

If A is a non singular matrix of order 3, then $|adj(A^3)| = (|A^3|)^2 = (|AAA|)^2 = (|A|\ |A|\ |A|)^2 = (|A|^3)^2 = |A|^6$.

112. (c)

–1

Explanation:

$$\begin{vmatrix} 2\cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$$

Put x = $\frac{\pi}{3}$, $\begin{vmatrix} 2\cos\frac{\pi}{3} & 1 & 0 \\ 1 & 2\cos\frac{\pi}{3} & 1 \\ 0 & 1 & 2\cos\frac{\pi}{3} \end{vmatrix}$

$\Rightarrow \begin{vmatrix} 2.\frac{1}{2} & 1 & 0 \\ 1 & 2.\frac{1}{2} & 1 \\ 0 & 1 & 2.\frac{1}{2} \end{vmatrix}$

$\Rightarrow \begin{vmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{vmatrix} \Rightarrow 1(0) - 1(1) = -1$

113. (c)

$x^3(x+10)$

Explanation:

$\begin{vmatrix} 1+x & 2 & 3 & 4 \\ 1 & 2+x & 3 & 4 \\ 1 & 2 & 3+x & 4 \\ 1 & 2 & 3 & 4+x \end{vmatrix}$

Apply, $C_1 \rightarrow C_1 + C_2 + C_3$

$\Rightarrow \begin{vmatrix} 10+x & 2 & 3 & 4 \\ 10+x & 2+x & 3 & 4 \\ 10+x & 2 & 3+x & 4 \\ 10+x & 2 & 3 & 4+x \end{vmatrix}$

$\Rightarrow (10+x)\begin{vmatrix} 1 & 2 & 3 & 4 \\ 1 & 2+x & 3 & 4 \\ 1 & 2 & 3+x & 4 \\ 1 & 2 & 3 & 4+x \end{vmatrix}$

Apply, $R_1 \rightarrow R_1 - R_2$

$\Rightarrow (10+x)\begin{vmatrix} 0 & -x & 0 & 0 \\ 1 & 2+x & 3 & 4 \\ 1 & 2 & 3+x & 4 \\ 1 & 2 & 3 & 4+x \end{vmatrix}$

$\Rightarrow (10+x)\begin{vmatrix} 1 & 3+x & 4 \\ 1 & 3 & 4 \\ 1 & 3 & 4+x \end{vmatrix}$

Apply, $R_1 \rightarrow R_1 - R_2$

$$\Rightarrow (10+x)\begin{vmatrix} 0 & x & 0 \\ 1 & 3 & 4 \\ 1 & 3 & 4+x \end{vmatrix} \Rightarrow (10+x)x^3$$

114. (c)

0

Explanation:

AREA OF TRIANGLE=

$\frac{1}{2}\begin{vmatrix} 1 & 1 & 1 \\ 2 & 2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$ (Since C_1 and C_2 are identical)

So, value of determinant = 0

Hence, area of triangle = 0

115. (c)

1 , 2 and 3

Explanation:

Expanding along C_1

$\begin{vmatrix} 1-x & 2 & 3 \\ 0 & 2-x & 0 \\ 0 & 2 & 3-x \end{vmatrix} = 0 \Rightarrow$ (1 - x)(2 - x)(3 - x) = 0$\Rightarrow$ x = 1, 2 ,3.

116. Conditions for the partition sub-sets to be an equivalence relation

(i) The partition sub-sets must be disjoint i.e.there is no common elements between them

(ii) Their union must be equal to the main set (super-set)

(a) ,(d) both

117. (a)

118. (a)

119. (c)

120. (a)