

PRACTICE PAPER

CHEMISTRY

Q1.

Two radioactive nuclides A and B have half-lives of 20 and 10 minutes respectively. If starts an experiment with one mole of each of them their mole ratio after a time interval of one hour will be

- (a) 8 : 1
- (b) 1 : 8
- (c) 1 : 3
- (d) 1 : 6

Q2.

What is the pH of a solution formed by mixing 40 ml of 0.1 M HCl and 10 ml 0.45 M NaOH?

- (a) 6
- (b) 8
- (c) 12
- (d) 10

Q3.

Equivalent mass of oxidizing agent in the reaction,  $\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 3\text{S} + 2\text{H}_2\text{O}$  is

- (a) 32
- (b) 64
- (c) 16
- (d) 8

Q4.

One mole of  $\text{N}_2\text{O}_4$  (g) at 300 K is kept in a closed container under one atmosphere. It is heated to 600 K when 20% by mass of  $\text{N}_2\text{O}_4$  (g) decomposes to  $\text{NO}_2$  (g) the resultant pressure is

- (a) 1.2 atm
- (b) 2.4 atm
- (c) 2.0 atm
- (d) 1.0 atm

Q5.

Chromatography is a technique based on

- (a) Solubilities of solute
- (b) Adsorption of solute
- (c) Chemical adsorption followed by dispersion
- (d) Differential adsorption of different constituent of mixture.

**Q6.**

One faraday of electricity will liberate one gram mole of metal from the solution or fused electrolyte of

- (a)  $\text{BaCl}_2$  (b)  $\text{CuSO}_4$   
(c)  $\text{AlCl}_3$  (d)  $\text{NaCl}$

**Q7.**

Which one of the following pairs of ions cannot be separated by  $\text{H}_2\text{S}$  in dilute  $\text{HCl}$  ?

- (a)  $\text{Bi}^{3+}, \text{Sn}^{2+}$   
(b)  $\text{Al}^{3+}, \text{Hg}^{2+}$   
(c)  $\text{Cu}^{2+}, \text{Zn}^{2+}$   
(d)  $\text{Ni}^{2+}, \text{Cu}^{2+}$

**Q8.**

The electronic configuration of two elements and B are:  $A = 1s^2 2s^2 2p^6 3s^1$  and  $B = 1s^2 2s^2 2p^3$ . The correct structural formula of the compound formed by them is.

- (a)  $\text{A}^+ \text{B}^-$   
(b)  $\text{A}^- \text{B}^+$   
(c)  $\text{A} - \text{B}$   
(d)  $\text{A}^{2+} (\text{B}^-)_2$

**Q9.**

Which of the following are isoelectronic and isostructural  $\text{NO}_3^-$ ,  $\text{C}_3^{2-}$ ,  $\text{ClO}_3^-$ ,  $\text{SO}_3$

- (a)  $\text{NO}_3^-$ ,  $\text{CO}_3^{2-}$   
(b)  $\text{SO}_3$ ,  $\text{NO}_3^-$   
(c)  $\text{Cl}_3^-$ ,  $\text{CO}_2^{2-}$   
(d)  $\text{CO}_3^{2-}$ ,  $\text{SO}_3$

**Q10.**

$\text{Cu}^+$  ion is not stable in aqueous solution because of disproportionation reaction.  $E^\circ$  value of disproportionation of  $\text{Cu}^+$  is

(given:  $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$ )

- (a)  $-0.19 \text{ V}$   
(b)  $0.38$   
(c)  $0.94 \text{ V}$   
(d)  $-0.38 \text{ V}$

**Q11.**

The solubility product ( $K_{sp}$ ) of AgCl is  $1.1 \times 10^{-10}$  and the concentration of  $Ag^+$  ions in given solution is  $1.0 \times 10^{-7}$  mole per litre. The concentration  $Cl^-$  for precipitation to occur will be

- (a)  $1.1 \times 10^{-3}$  moles per litre
- (b) More than  $1.1 \times 10^{-3}$  moles per litre
- (c) Less than  $1.1 \times 10^{-3}$  moles per litre
- (d) None of these

**Q12.**

When an ideal gas is allowed to expand adiabatically into an evacuated container which of the following is not equal to zero?

- (a)  $\Delta S$
- (b)  $\Delta G$
- (c)  $\Delta U$
- (d)  $W$

**Q13.**

Which of the following compounds is unsuitable for use in desiccators?

- (a)  $CaCl_2$
- (b)  $H_2SO_4$
- (c)  $P_2O_5$
- (d)  $Na_2SO_4$

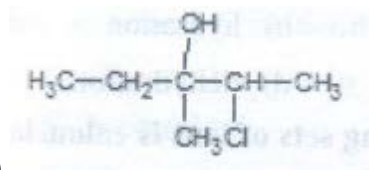
**Q14.**

Caprolactam Polymerises to give

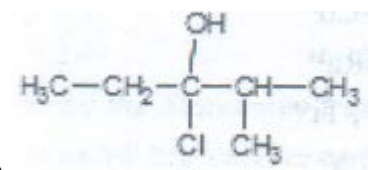
- (a) Terylene
- (b) Teflon
- (c) Glyptal Nylon – 6

Q15.

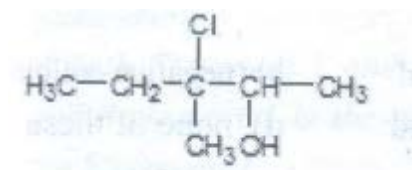
The predominant product formed when 3 methyl - 2 - pentene reacts with HOCl is



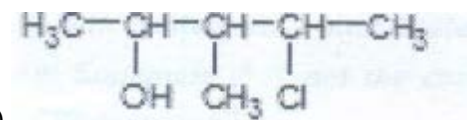
a)



b)



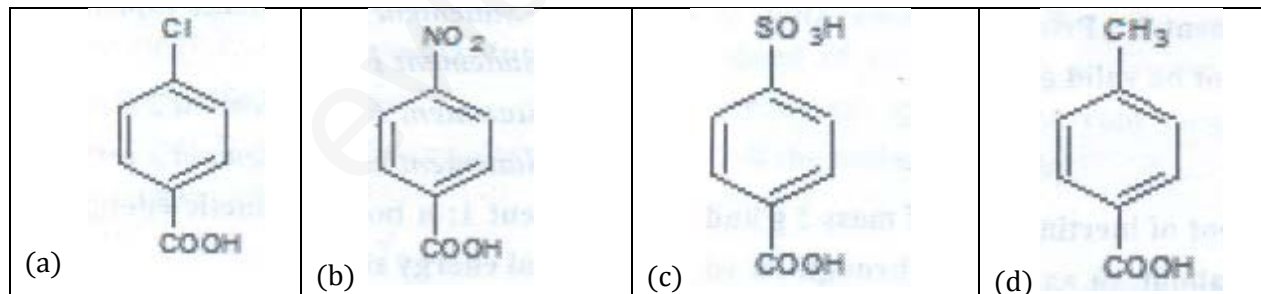
c)



d)

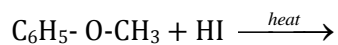
Q16.

Which of the following compounds is a weaker acid as compared to the benzoic acid?



Q17.

The products formed in the following reaction are



- (a)  $\text{C}_6\text{H}_5\text{-OH}$  and  $\text{CH}_3\text{-I}$
- (b)  $\text{C}_6\text{H}_5\text{-I}$  and  $\text{CH}_3\text{-OH}$
- (c)  $\text{C}_6\text{H}_5\text{-CH}_3$  and  $\text{HOI}$
- (d)  $\text{C}_6\text{H}_6$  and  $\text{CH}_3\text{OI}$

Q18.

2 - Methyl propene is isomeric with butane - 1, they can be distinguished by

- (a) ammoniacal cuprous chloride
- (b) 1% alkaline solution of  $\text{KMnO}_4$
- (c) Bromine water
- (d) Ozonolysis

Q19.

The compound in which all carbon atoms use one  $\text{sp}^3$  hybrid orbitals for bond formation is

- (a)  $\text{CH}_3\text{CHO}$
- (b)  $\text{CH}_3\text{COCH}_3$
- (c)  $(\text{CH}_3)_3\text{COH}$
- (d)  $\text{HCOOH}$

Q20.

Which one of the following reaction can not be used for the preparation of iodoform?

- (a)  $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{warm}]{\text{I}_2 \text{ alkali}}$
- (b)  $\text{CH}_3\text{COCH}_3 \xrightarrow[\text{warm}]{\text{I}_2 \text{ alkali}}$
- (c)  $\text{CH}_3 - \text{CH}(\text{OH}) - \text{CH}_3 \xrightarrow[\text{warm}]{\text{I}_2 \text{ alkali}}$
- (d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \xrightarrow[\text{warm}]{\text{I}_2 \text{ alkali}}$

Q21.

Which chemical substance acts as emulsifier in lipid metabolism?

- (a) Amino acid
- (b) Bile acid
- (c) Nucleoside
- (d) Fatty acid

Q22.

Which of the following acids has maximum number of P - H bonds?

- (a)  $\text{H}_2\text{PO}_4$
- (b)  $\text{H}_3\text{PO}_2$
- (c)  $\text{H}_3\text{PO}_3$
- (d)  $\text{H}_4\text{P}_2\text{O}_7$

**Q23.**

Which of the following reagents are not correctly mentioned?

- (a) Benedict's solution –  $\text{CuSO}_4$  solution + sodium citrate +  $\text{Na}_2\text{CO}_3$
- (b) Barfoed's reagent –  $\text{Cu}_2\text{O}$  +  $\text{CH}_3\text{COOH}$
- (c) Etar'd reagent -  $\text{CrO}_2\text{Cl}_2$
- (d) Fenton's reagent –  $\text{Fe}_2(\text{SO}_4)_3$  +  $\text{H}_2\text{O}_2$

**Q24.**

Propene reacts with HBr in presence of peroxide to give rise to

- (a)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Br}$
- (b)  $\text{CH}_3 - \text{CHBr} - \text{CH}_3$
- (c)  $\text{CH}_3 - \text{CBr}_2 - \text{CH}_3$
- (d)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CHBr}_2$

**Q25.**

Which of the following is formed when 1, 3 – dibromopropane reacts with zinc?

- (a)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$
- (b)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
- (c) propene
- (d) Cyclopropane

**Q26.**

Which of the following compounds is most soluble in water?

- (a)  $\text{MgSO}_4$
- (b)  $\text{CaSO}_4$
- (c)  $\text{SrSO}_4$
- (d)  $\text{BaSO}_4$

**Q27.**

The absolute temperature of an ideal gas

- (a) is proportional to the average potential energy of the molecules
- (b) is proportional to the average speed of the molecules
- (c) is proportional to the average kinetic energy of the molecules
- (d) is inversely proportional to the partial pressure

**Q28.**

The setting of plaster of paris takes place due to

- (a) loss of  $\text{CO}_2$
- (b) hydration
- (c) hydrolysis
- (d) dehydration

**Q29.**

Which of the following sets of ions is colourless?

- (a)  $\text{Zn}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Ti}^{3+}$ ,  $\text{Co}^{2+}$
- (b)  $\text{Zn}^{2+}$ ,  $\text{Cu}^+$ ,  $\text{Ti}^{4+}$ ,  $\text{Ra}^{2+}$
- (c)  $\text{Cr}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ti}^{4+}$
- (d)  $\text{Mn}^{7+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Cu}^+$ ,  $\text{V}^{2+}$

**Q30.**

$\text{As}_2\text{S}_3$  sol is

- (a) Positive colloid
- (b) Negative colloid
- (c) Neutral colloid
- (d) None of these

### PHYSICS

**Q1.**

The S.I. unit of Hubble constant in fundamental quantities is

- (a) Metre per second
- (b) Per second
- (c) Kilogram second
- (d) Kilogram per metre per second

**Q2.**

A ball starts falling from rest on a smooth inclined plane forming an angle  $\alpha$  with horizontal. After covering distance  $h$  the ball rebounds off the plane. The distance from the impact point where the ball rebounds for second time is

- (a)  $8h \cos \alpha$
- (b)  $8h \sin \alpha$
- (c)  $2h \tan \alpha$
- (d)  $4h \sin \alpha$

**Q3.**

A shell at rest the origin explodes into three fragments of masses 1 kg, 2kg and m kg. the first two pieces fly off with speeds of 12 m/s along x axis and 16 m/s along y axis respectively. If the m kg piece flies off with a speed of 40 m/s, the total mass of the shell will be

- (a) 3.8 kg
- (b) 4.8 kg
- (c) 5 kg
- (d) 5.2 kg

Read the Statement 1 and Statement 2 carefully to mark the correct option out of the option given below

- (1) If both Statement 1 and Statement 2 are true and Statement 2 is the correct explanation of the Statement 1
- (2) If both Statement 1 and Statement 2 are true but Statement 2 is not the correct explanation of Statement 1
- (3) If Statement 1 is true but Statement 2 is false
- (4) If Statement 1 is false but Statement 2 is true

**Q4.**

Statement 1: a body may gain kinetic energy and potential energy simultaneously.

Statement 2 : Principle of conservation of energy may not be valid every time

- (a) 1
- (b) 2
- (c) 3
- (d) 4

**Q5.**

Moment of inertia of a ring of mass 3 g and radius 1 cm about an axis passing through its edge and parallel to its natural axis is

- (a) 10 g cm<sup>2</sup>
- (b) 100 g cm<sup>2</sup>
- (c) 6 g cm<sup>2</sup>
- (d) 1 g cm<sup>2</sup>



**Q6.**

Height at which the value of  $g$  becomes  $1/4^{\text{th}}$  of that on earth is

- (a)  $R$
- (b)  $4R$
- (c)  $2R$
- (d)  $3R/2$

**Q7.**

Sudden fall of pressure at a place indicates

- (a) Storm
- (b) Calm
- (c) Rain
- (d) Normal weather

**Q8.**

Two rods of different materials having coefficient of thermal expansion  $\alpha_1$  and  $\alpha_2$  and Young's modulus  $Y_1$  and  $Y_2$  respectively are fixed between two rigid massive walls. The rods are heated such that the increase in temperature is same and there is no bending of rods. If  $\alpha_1 : \alpha_2 = 2 : 3$ , the thermal stress in the rods will be equal if  $Y_1 : Y_2$  is equal to

- (a)  $2 : 3$
- (b)  $1 : 1$
- (c)  $3 : 2$
- (d)  $4 : 9$

**Read the Statement 1 and Statement 2 carefully to mark the correct option out of the option given below**

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- (3) If Statement 1 is true but Statement 2 is false
- (4) If Statement 1 is false but Statement 2 is true

**Q9.**

Statement 1: A gas at high temperature and low pressure behaves as an ideal gas

Statement 2: A gas in which intermolecular forces are zero is called ideal gas

- (a) 1
- (b) 2
- (c) 3
- (d) 4

**Q10.**

The speed of sound through a gaseous medium has a constant ratio with the root mean square speed of the molecules given by

- (a)  $\sqrt{2} \gamma / 3$
- (b)  $\gamma$
- (c)  $\sqrt{\gamma} / 3$
- (d)  $\gamma - 1$

**Q11.**

A tuning fork is found to give 20 beats in 2 seconds when sounded with a stretched string vibrating transversely such that resonance lengths are either 10.2 cm or 9.2 cm. The frequency of tuning fork is

- (a) 133 Hz
- (b) 333 Hz
- (c) 323 Hz
- (d) 233 Hz

**Q12.**

An electric field  $E = i + j + k$  has a dipole moment  $p = 5i + j - 2k$ . the direction cosines of the torque experienced by the dipole are

- (a) 0.53, 0.18, 0.74
- (b) 0.35, 0.81, 0.47
- (c) 0.35, 0.18, 0.47
- (d) 0.35, 0.09, 0.47

**Q13.**

A part of length of a wire was uniformly stretched till the final length of wire became 1.5 times the original length and the resistance were quadrupled. The part of the length of the wire was a fraction equal to

- (a)  $1/8$
- (b)  $1/6$
- (c)  $1/10$
- (d)  $1/4$

**Q14.**

$H^+$ ,  $He^+$  and  $O^{++}$ , all having the same kinetic energy pass through a region in which there is a uniform magnetic field perpendicular to their velocity. The masses of  $H^+$ ,  $He^+$  and  $O^{++}$  are 1 amu, 4 amu and 16 amu and 16 amu respectively, then

- (a)  $H^+$  will be deflected most
- (b)  $O^{++}$  will be deflected most
- (c)  $He^+$  and  $O^{++}$  will be deflected most
- (d) All will be deflected equally

**Q15.**

A  $36 \Omega$  galvanometer is shunted by a resistance of  $4 \Omega$ . The percentage of total current, which passed through the galvanometer is

- (a) 8%
- (b) 9%
- (c) 10%
- (d) 91%

**Q16.**

A coil of inductance  $8.4 \text{ mH}$  and resistance  $6 \Omega$  is connected to a  $12 \text{ V}$  battery. The current in the coil is  $1 \text{ A}$  at an approximate time of

- (a)  $500 \text{ s}$
- (b)  $20 \text{ s}$
- (c)  $35 \text{ ms}$
- (d)  $1 \text{ ms}$

**Q17.**

In an a.c. circuit  $V$  and  $I$  is given by  $V = 100 \sin$  Power dissipated in the circuit is

- (a) 104 W
- (b) 25 W
- (c) 10 W
- (d) 250 W

**Q18.**

Electromagnetic waves can be deflected by

- (a) electric field only
- (b) magnetic field only
- (c) both (1) and (2)
- (d) none of these

**Q19.**

The distance between the projector and the screen is increased by 2%. The new intensity of illumination of the screen

- (a) decreases by 4%
- (b) increases by 2%
- (c) decreases by 2%
- (d) increases 4%

**Q20.**

Refractive index of water relative to air is 1.33 and that of an oil with respect to air is 1.45. The refractive indices of oil with respect to water and of water with respect to oil are

- (a) 0.91, 1.09
- (b) 1.09, 0.91
- (c) 0.75, 1.07
- (d) 1.07, 0.75

**Q21.**

A shortsighted person cannot see objects beyond a distance of 4m from him clearly. What is the power of glasses to be used so that he may see distant objects distinctly?

- (a) - 0.25 D
- (b) 0.25 D
- (c) 0.52 D
- (d) - 0.52 D

Read the following paragraph

Light beam of energy 2.07 eV incident on metal surface of work function 2eV. The wavelength of incident photon and the de Broglie wavelength of photoelectron are calculated.

Now answer the following questions

**Q22.**

Wavelength of incident photon is

- (a)  $6 \times 10^{-7}$  m
- (b)  $7 \times 10^{-7}$  m
- (c)  $8 \times 10^{-8}$  m
- (d)  $5 \times 10^{-5}$  m

**Q23.**

De Broglie wavelength of photoelectron is

- (a)  $6.4 \times 10^{-9}$  m
- (b)  $4.6 \times 10^{-9}$  m
- (c)  $9.6 \times 10^{-6}$  m
- (d) None of these

**Q24.**

Radiations of wavelength  $\lambda$  are incident on atoms of hydrogen in ground state. these atoms absorb fraction of these radiations. The excited atoms have ten different wavelengths in the emission spectrum. The value of  $\lambda$  is

- (a) 570 A°
- (b) 750 A°
- (c) 590 A°
- (d) 950 A°

**Q25.**

Two wires P and Q made up of different materials have some resistance at room temperatures. When heated, resistance of P increases and that of Q decreases. The conclusion may be drawn that

- (a) P and Q are both conductors but it happens so because of being made of different materials
- (b) P is n-type semiconductor and Q is p -type semiconductor
- (c) P is a semiconductor and Q is a conductor
- (d) P is a conductor and Q is a semiconductor

**Q26.**

The modulation index for an AM wave for which the maximum amplitude is  $a$ , the minimum amplitude will be

- (a)  $(a + b) / (a - b)$
- (b)  $(a - b) / (a + b)$
- (c)  $(2a - b) / (a + 2b)$
- (d)  $(b - 2a) / (2a + b)$

**Q27.**

A block of base  $10\text{cm} \times 10\text{cm}$  and height  $15\text{cm}$  is kept on an inclined plane. The coefficient of friction between them is  $\sqrt{3}$ . The inclination  $\theta$  of this inclined plane from the horizontal plane is gradually increased from  $0^\circ$ . Then

- (a) At  $\theta = 30^\circ$ , the block will start sliding down the plane
- (b) The block will remain at rest on the plane upto certain  $\theta$  and then it will topple
- (c) at  $\theta = 60^\circ$ , the block will start sliding down the plane and continue to do so at higher angles
- (d) at  $\theta = 60^\circ$ , the block will start sliding down the plane and on further increasing  $\theta$ , it will topple at certain  $\theta$

**Q28.**

A spring of force constant  $k$  is cut into two pieces and one piece is double the length of other. The long piece is double the length of other. The long piece will have a force constant of

- (a)  $2k / 3$
- (b)  $3k / 2$
- (c)  $3k$
- (d)  $6k$

**Q29.**

A vessel contains (density =  $0.8\text{g} / \text{cm}^3$ ) over mercury (density  $13.6\text{g} / \text{cm}^3$ ). A homogeneous sphere floats with half its volume immersed in mercury and the other half in oil. The density of the material of the sphere in  $\text{g} / \text{cm}^3$  is

- (a) 3.3
- (b) 6.4
- (c) 7.2
- (d) 12.8

Q30.

70 calories of heat are required to raise the temperature of 2 moles of an ideal diatomic gas at constant pressure from  $30^\circ\text{C}$  to  $35^\circ\text{C}$ . The amount of heat required (in calorie) to raise the temperature of the same gas through the same range of  $30^\circ\text{C}$  to  $35^\circ\text{C}$ , at constant volume is

- (a) 30
- (b) 50
- (c) 70
- (d) 90

MATHEMATICS

Q1.

Let  $A = \{1, 2, 3, 4, 5, 6\}$ , which of the following partitions of  $A$  correspond to an equivalence relation of  $A$ ?

- (a)  $\{1, 2, 3\}, \{3, 4, 5, 6\}$
- (b)  $\{1, 2\}, \{3, 4\}, \{2, 3, 5, 6\}$
- (c)  $\{1, 3\}, \{2, 4, 5\}, \{6\}$
- (d)  $\{1, 2\}, \{4, 5, 6\}$

Q2.

The value of the function  $f(n)$  is  $\frac{35}{16}$  and is represented as  $f(n) = \sum_{n=0}^{\infty} (1 + 3n)x^n$ . Find the value of  $x$ .

- (a)  $1/5$
- (b)  $2/5$
- (c)  $3/5$
- (d)  $4/5$

Q3.

The complex number  $z = x + yi$ , which satisfies the equation  $\frac{|z-3i|}{|z+3i|} = 1$ , lie on

- (a) The  $x$  - axis
- (b) The straight line  $y = 3$
- (c) A circle passing through the origin
- (d) The  $y$  - axis

**Q4.**

The greatest value of  $\frac{4}{4x^2+4x+9}$  is

- (a) 1
- (b)  $\frac{1}{2}$
- (c)  $\frac{1}{3}$
- (d)  $\frac{1}{4}$

**Q5.**

If  $A = \frac{\cos \alpha}{\sin \alpha} - \frac{\sin \alpha}{\cos \alpha}$  such that  $A + A^c = 1$ , then value of  $\alpha$  is

- (a)  $\pi$
- (b)  $\pi/2$
- (c)  $\pi/3$
- (d)  $\pi/4$

**Q6.**

The complex number  $\left(\frac{1+2i}{1-i}\right)$  lies in

- (a) I quadrant
- (b) II quadrant
- (c) III quadrant
- (d) IV quadrant

**Q7.**

If  $x + ay = 0$ ;  $+ az = 0$ ;  $z + ax = 0$ , then the value of 'a' for which the system of equations will have infinite number of solution is

- (a) - 1
- (b) 0
- (c) 1
- (d) None of these

**Q8.**

The number of ways in which one or more balls can be selected out of 10 white, 9 green and 7 blue balls is

- (a) 875
- (b) 879
- (c) 885
- (d) None of these



Q9.

The value of  ${}^1C_1 - {}^2C_2 + {}^3C_3 + \dots + (-1)^{n-1} {}^nC_n$  is

- (a) 0
- (b)  $2^n$
- (c)  $2^{n-1}$
- (d) None of these

Q10.

If  $\log 2$ ,  $\log(2^x - 1)$  and  $\log(2^x + 3)$  are in A.P, then  $x$  is equal to

- (a) 0
- (b)  $\log_3 2$
- (c)  $\log_2 5$
- (d)  $\log_2 3$

Q11.

If  $f(x) = \frac{1}{3x+1}$ , find the value of  $f'(0)$

- (a) 0
- (b) is positive
- (c) is negative
- (d) does not exist

Q12.

If  $y = \cot^{-1} \frac{1-x}{1+x}$ , then  $\frac{dy}{dx} =$

- (a)  $\frac{1}{(1+x^2)}$
- (b)  $\frac{-1}{(1+x^2)}$
- (c)  $\frac{(1-x^2)^2}{1+x^2}$
- (d)  $\frac{-x}{(1+x)^2}$

Q13.

$\int \sec^2 x \cos^2 x dx =$

- (a)  $\tan x - \cot x$
- (b)  $\sec x$
- (c)  $\tan x \sec x$
- (d) none of these

**Q14.**

$\int_0^{\infty} \frac{\log(1+x^2)}{(1+x^2)} dx$  is equal to

- (a)  $\pi \log 2$
- (b)  $(\pi/2)^2 \log 2$
- (c)  $-\pi^2 \log 2$
- (d)  $\pi / 2 \log 2$

**Q15.**

The differential equation representing the family of curve  $y^2 = 2c(x + \sqrt{c})$ , where  $c$  is a positive parameter, is of

- (a) order 1
- (b) order 2
- (c) degree 3
- (d) none of these

**Q16.**

The solution of the differential equation  $x \frac{dy}{dx} = y(\log y - \log x + 1)$  is

- (a)  $y = x e^{cx}$
- (b)  $y = e^{-cx}$
- (c)  $y + e^x = ce^x$
- (d) none of these

**Q17.**

Distance between lines  $5x + 12y - 1 = 0$  and  $10x + 24y + k = 0$  is 2, then value of  $k$  is

- (a) 54
- (b) -54, 50
- (c) - 50
- (d) 56

**Q18.**

If  $x + y = k$  is normal to  $y^2 = 12x$ , then  $k$  is

- (a) 4
- (b) 5
- (c) 7
- (d) 9

**Q19.**

The equation of plane containing the line  $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$  and the point (0, 7, -7) is

- (a)  $x + y + z = 0$
- (b)  $x + y + z = 2$
- (c)  $x + y + z = 1$
- (d) None of these

**Q20.**

The plane  $x - 2y + z - 6 = 0$  and line  $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$

- (a) Parallel of plane
- (b) lies in plane
- (c) at right angle to plane
- (d) none of these

**Q21.**

Two forces P and Q act at such an angle that the resultant R is equal to P. If P is doubled then new resultant makes an angle

- (a)  $60^\circ$  with Q
- (b)  $90^\circ$  with Q
- (c)  $120^\circ$  with Q
- (d) none of these

**Q22.**

The probability that A can solve a problem is  $\frac{2}{3}$  and the probability that B can solve the problem is  $\frac{3}{4}$ . The probability that at least one of A and B will be to solve the problem is

- (a)  $\frac{11}{12}$
- (b)  $\frac{9}{13}$
- (c)  $\frac{3}{4}$
- (d) none of these

**Q23.**

When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is

- (a)  $\frac{2}{27}$
- (b)  $\frac{4}{27}$
- (c)  $\frac{7}{27}$
- (d)  $\frac{8}{27}$

**Q24.**

The principal value of  $\sin^{-1} \left[ \sin \left( \frac{2\pi}{3} \right) \right]$  is

- (a)  $\pi/3$
- (b)  $2\pi/3$
- (c)  $4\pi/3$
- (d) none of these

**Q25.**

Two packs of 52 cards are shuffled together. The number of ways in which a man can deal with cards, so that he does not get two cards of the same suit the same denominations is

- (a)  ${}^{52}C_{26} \cdot 2^{26}$
- (b)  ${}^{104}C_{26}$
- (c)  ${}^{52}C_{26}$
- (d) none of these

**Q26.**

The term independent of  $x$  in the expansion of  $(1+x)^n (1+1/x)^n$  is

- (a)  $C_0^2 + C_1^2 + \dots + C_n^2$
- (b)  $(C_0 + C_1 + \dots + C_n)^2$
- (c)  $C_0^2 + 2^2 C_1^2 + 3^2 C_1^2 + \dots + (n+1)^2 C_n^2$
- (d) None of these

**Q27.**

$$\int_0^{\pi/2} \frac{1}{1+\sin x} dx$$

- (a)  $\frac{1}{2}$
- (b) - 1
- (c) 1
- (d) None of these

**Q28.**

If  $y = \tan^{-1} \left( \frac{\sin x + \cos x}{\cos x - \sin x} \right)$ , then  $\frac{dy}{dx}$  is equal to

- (a) 0
- (b) 1
- (c)  $\frac{1}{2}$
- (d)  $\frac{3}{2}$

**Q29.**

If  $f(x + y) = f(x) + f(y)$  and  $f(1) + f(2) + f(3) + \dots + f(10) = 1$ , find the value of  $f(1)$ .

- (a) 2
- (b)  $1/55$
- (c)  $1/54$
- (d)  $1/45$

**Q30.**

The expansion of  $(6 - 3x)^{-\frac{1}{2}}$ , in power of  $x$  is valid if

- (a)  $|x| < 0$
- (b)  $|x| > 0$
- (c)  $|x| < 2$
- (d)  $|x| > 2$