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# IPU CET 2013 Question Paper

Indraprastha University Common Entrance Test (IPU CET)

# GGSIPU physics 2013

1. In a common base configuration $I_e$ = 1 mA ;$\alpha$ = 0.95, the value of base current is

a 1.95 mA b 0.05 mA

c 1.05 mA d 0.95 mA

2. A Si specimen is made into p-type semiconductor is made into by doping on an average one indium atom per 6 x $10^7$ silicon atoms. If the number density of atoms in Si be 6 x $10^{28/}m^3$ , what is the indium atoms per $cm^3$?

a $10^{12}$ b $10^{15}$

c $10^{18}$ d $10^{20}$

3. The minimum wavelemgth of X-ray emitted by X-ray tube is 0.4125 $\mathring{A}$. The accelerating voltage is

a 30 kV b 50 kV

c 80 kV d 60 kV

4. The ionization potential of hydrogen atom is 13.6 V. How much energy need to be supplied to ionize the hydrogen atom in the first excited state?

a 13.6 eV b 27.2 eV

c 3.4 eV d 6.8 eV

5. What is the percentage error in the measurement of time period of a pendulum if maximum errors in measurement of l and g are 2% and 4% respectively

a 6% b 4%

c 3% d 5%

6. A body travelling along a straight line one-third of the total distance with a velocity 4 m/s. The remaining part of the distance was covered with a velocity 2 m/s for half the time and with a velocity 6 m/s for the whole time of motion is

a 5 m/s b 4 m/s

c 4.5 m/s d 3.5 m/s

7. A body of mass 2 kg moves with an acceleration 3 $ms^{-2}$. The change in momentum in one second is

a $\frac{2}{3}$ kg $ms^{-1}$ b $\frac{3}{2}$ kg $ms^{-1}$

c 6 kg ms $^{-1}$ d None of these

8. When an axle rotates in a sleeve,the friction involved in the process is

a sliding b rolling

c lim iting d None of these

9. Two bodies A and B having mass m and respectively passes same kinetic energy. Given that M>m. If $p_A$ and $p_B$ be their moments, then which of the following statements is true?

a $\rho_A = \rho_B$ b $\rho_A > \rho_B$

c $\rho_A < \rho_B$ d It cannot be predicted

10. A gun of mass M fires a bullet of mass m with maximum speed $v$. Given that m<M. The kinetic energy of the gun will be

a $\frac{1}{2}mv^2$ b $\frac{1}{2}Mv^2$

c more than $\frac{1}{2}mv^2$ d less than $\frac{1}{2}Mv^2$

11. If a solid sphere and solid cylinder of same mass and density rotate about their own axis the moment of inertia will be greater for

a solid sphere b solid cylinder

c both a and b d equal both

12. if V is the gravitational potential on the surface of the earth,then what is its value at the centre of the earth?

a 2V b 3V c $\frac{3}{2}V$ d $\frac{2}{3}V$

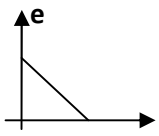
13. If $\gamma$ be the ratio of specific heats of a perfect gas, the number of degrees of freedom of a molecule of the gas is

a $\frac{25}{2}(\gamma-1$ b $\frac{3\gamma-1}{2\gamma-1}$

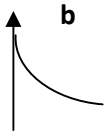
c $\frac{2}{\gamma-1}$ d $\frac{9}{2}(\gamma-1$

14. If L-R circuit connected to a battery of constant emf E switch S is closed at time t =0. If e denotes the induced emf across inductor and I the current in the circuit at any time t. Then which of the following graphs shows the variation of e with i?

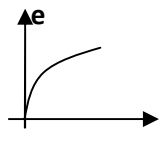
a

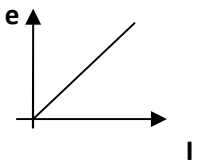



b



I → I

c 


d 


15. Two identical glass $\mu_g = 3/2$ equiconvex lenses of focal length f are kept in contact. The space between the two lenses is filled with water $\mu_w = 4/3$. The focal length of the combination is

a f b f/2 c $\frac{4f}{3}$ d $\frac{3f}{4}$

16. A slab consists of two parallel layers of two different materials of same thickness and thermal conductivies $\Re_1$ and $\Re_2$. The equivalent thermal conductivity of the slab is

a $k_1 - k_2$

b $k_1 / k_2$

c $\frac{2k1\ k2}{k1+k2}$

d $\frac{k1+k2}{2k1\ k2}$

17. The relation between Young's modulusY, bulk modulus K and modulus of elasticity $\eta$ is

a $\frac{1}{y} = \frac{1}{k} = \frac{3}{\eta}$

b $\frac{3}{y} = \frac{1}{\eta} + \frac{1}{3k}$

c $\frac{1}{y} = \frac{3}{\eta} + \frac{1}{3k}$

d $\frac{1}{\eta} = \frac{3}{y} + \frac{1}{3k}$

18. A point particle of mass 0.1 kg is executing SHM of amplitude 0.1 m. When the particle passes through the mean position, its KE is $8 \times 10^{-3}$ J. The equation of motion of this particle phase of oscillation is $45^0$ is

a $y = 0.1\sin\left(\frac{t}{4} + \frac{\pi}{4}\right)$

b $y = 0.1\sin\left(\frac{t}{2} + \frac{\pi}{4}\right)$

c $y = 0.1\sin\left(4t - \frac{\pi}{4}\right)$

d $y = 0.1\sin\left(4t + \frac{\pi}{4}\right)$

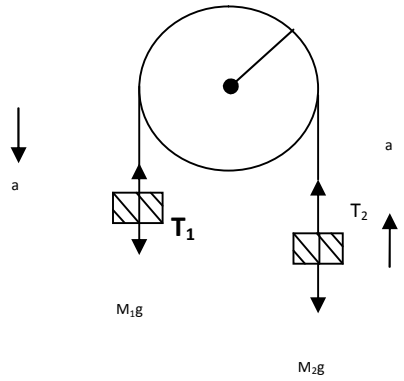
**19. A man weights 60 kg at earth surface. At what height above the earth's surface weight become 30 kg?**

Given redius of earth is 6400 km.

a 2624 km b 3000 km

c 2020 km d None of these

**20. Two bodies $m_1$ and $m_2$ are attached to the two ends of a string figure. The string passes over a pulley of mass M and radius R. If $m_1 > m_2$, then the acceleration of the system is**




a $\frac{(m_1 - m_2 + m)g}{m_1 + m_2 + m}$ b $\frac{(m_1 - m_2)g}{m_1 + m_2}$

c $\frac{(m_1 + m_2)g}{m_1 - m_2}$ d $\frac{(m_1 - m_2)g}{m_1 + m_2 + m/2}$

**21. A ball falls vertically onto a floor with momentum p and then bounces repeatedly, the coefficient of restitution is e. The total momentum imparted by the ball to the floor is**

a $\rho\{1+e)$ b $\frac{1}{1-e}$

c $\rho\left(\frac{1+e}{1-e}\right)$ d $\rho\left(1 - \frac{1}{e}\right)$

**22. A machine which is 75 per cent efficient uses 12 J of energy is lifting up a 1 kg mass through a certain distance. The mass is then allowed to fall through that distance. What will its velocity be at the end of its fall?**

a $\sqrt{24}$ m/s  b $\sqrt{32}$ m / s

c $\sqrt{8}$ m/s  d $\sqrt{9}$

**23. An unloaded car moving with velocity u on a frictionless road can be stopped in a distances s. If passengers add 40% to its weight and breaking force remains the same, the stopping distance at velocities is now**

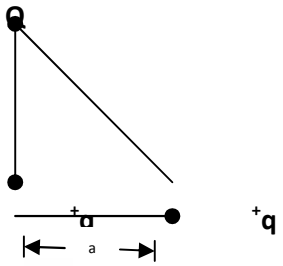
a 1.4 s  b $\sqrt{1.4}$ s  c 1.4 $^2$ s  d $\frac{1}{1.4}$ s

**24. A hollow charged metal sphere has a redius r. If the potential difference between its surface and a point at distance 3r from the centre is**

a V/6r  b V/4 r

c V/3 r  d v/2 r

**25. Three charges Q,q and – q are placed at the vertices of right angled isosceles triangle as shown in the figure. The net electrostatic energy of the configuration is zero if Q is equal to**



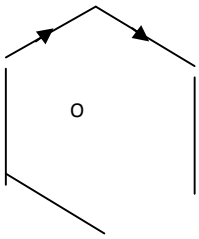

a $\frac{-q}{1+\sqrt{2}}$

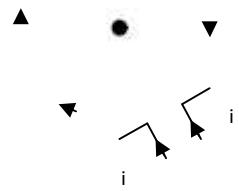
b $\frac{-2q}{2+\sqrt{2}}$

c $-2q$

d $+2$

**26. A current I is is flowing in a hexagonal coil of side l figure. The magnetic induction at the centre of the coil will be**





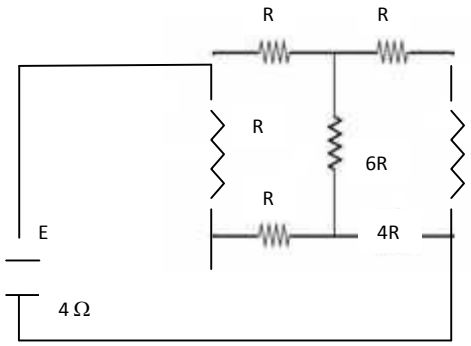

a $\frac{\sqrt{3}\mu_{0i}}{\pi l}$

b $\frac{\mu_{0i}}{\sqrt{3}\pi l}$

c $\frac{\mu_{0i}}{3\sqrt{3}\pi l}$

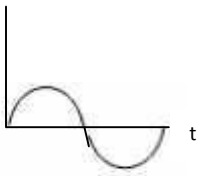
d $\frac{3\sqrt{3}\mu_{0i}}{\pi l}$

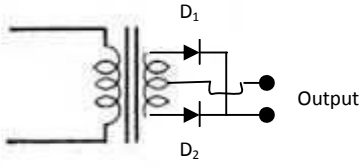
**27. A battery of internal resistance 4 Ω is connected to the network of resistances as shown. In order that the maximum power can be delivered to the network, the value R in Ω should be**

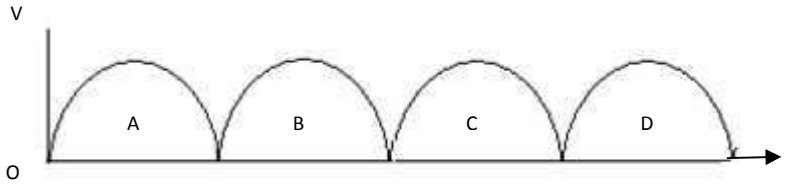



a) $\frac{4}{9}$ b 2 c $\frac{8}{3}$ d 18

**28. A full wave rectifier circuit along with the output is shown in the figure. The contributions from the diode is are**






a C b A,C

c B,C,D d A,B,C,D

**29. A radioactive substance X decays into another radioactive substance Y. Initially only X was present, $\lambda x$ and $\lambda y$ are the disintegration constants of X and Y. $N_x$ and $N_y$ are the number of nuclei of X and Y at any time t. Number of nuclei $N_y$ will be maximum when**

a $\frac{N_y}{N_x - N_y} = \frac{\lambda_y}{\lambda_x - \lambda_y}$

b $\frac{N_x}{N_x - N_y} = \frac{\lambda_x}{\lambda_x - \lambda_y}$

c $\lambda_y N_y = \lambda_k N_x$

d $\lambda_y N_y = \lambda_k N_x$

**30. An electron in hydrogen atom after absorbing an energy photonjumps from energy state $n_1$ to $n_2$. Then it returns to ground state after emitting six different wavelengths in emission spectrum. The energy of emitted photons is either equal to less than the absorbed photons. The $n_1$ and $n_2$ are**

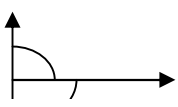
a $n_2 = 4, n_1 = 3$

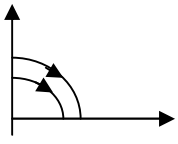
b $n_2 = 5, n_1 = 3$

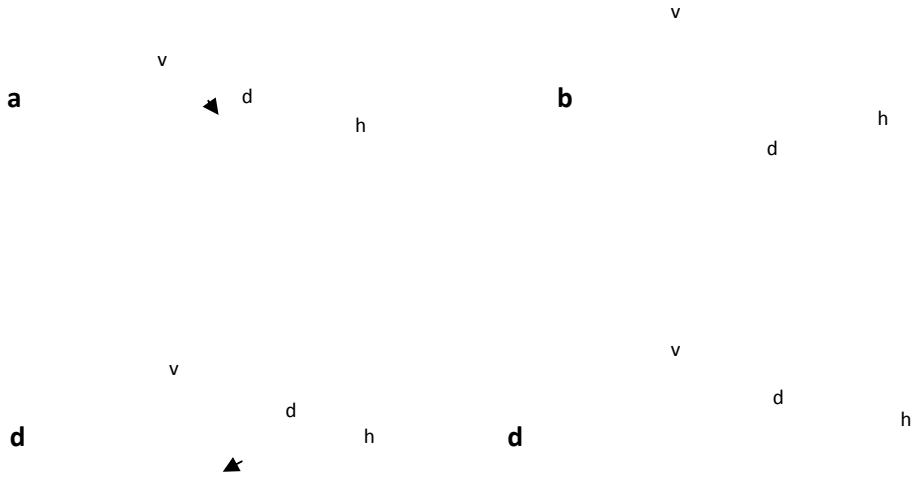
c $n_2 = 4, n_1 = 1$

d $n_2 = 4, n_1 = 1$

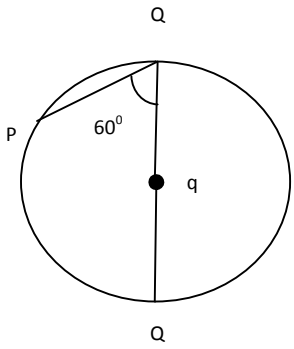
**31. A ball is drpped vertically from a height d above the ground and bounce up vertically to a height d/2. Neglecting subsequent motion and air resistance its velocity $v$ varies with height h above the ground as**








**32. Two particles 1 and 2 are allowed to descend on two frictionless chords OP and OQ. The ratioof the speeds of the particles 1 and 2 respectivelv when they reach on the circumference is**




**a** $\frac{1}{4}$ **b** $\frac{1}{2}$

**c** 1 **d** $\frac{1}{2\sqrt{2}}$

**33. A body of mass m, having momentum p is moving on a rough horizontal surface. If it is stopped in a distance x, the coefficient of friction between the body and the surface is**

**a** $\mu = \frac{p}{2mgx}$ **b** $\mu = \frac{p^2}{2mgx}$

**c** $\mu = \frac{p^2}{2gm^2x}$ **d** $\mu = \frac{p^2}{2gm^2x^2}$

**34. When a ceiling fan is switched off, its angular velocity reduces to half its initial value after it completes 36 rotations. The number of rotations it will make further before coming to rest is Assuming angular retardation to be uniform**

a 10 b 20

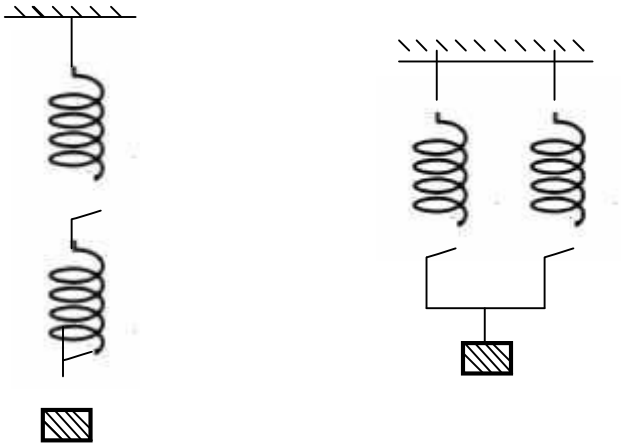
c 18 d 12

35. A uniform metal rod is used as a bar pendulum. If the room temperature rises by $10^0$ C and the coefficient of linear expansion of the metal of the rod is $2 \times 10^{-6}$ per $^0$C , the period of the pendulum will have percentage increases of

a $-2 \times 10^{-3}$ b $-1 \times 10^{-3}$

c $2 \times 10^{-3}$ d $1 \times 10^{-3}$

36. Two identical springs of constant are connected in series and parallel as shown in figure. A mass m is suspended from them. The ratioo0f their frequencies of vertical oscillations will be



a 2:1 b 1:1

c 1:2 d 4:1

37. An astronaut is approaching the moon. He sends a radio wave of frequency $5 \times 10^9$ Hz towards the moon. The frequency of the radio echo received by him has a frequency $9 \times 10^4$ Hz more than that of the real frequency. The relative to the moon is

a 5.40 km/s b 4.05 km/s

c 2.70 km/s d 1.35 km/s

38. Ultraviolet light of wavelength 300 nm and intensity 1.0 W/$m^2$ falls on the surface of a photosensitive material. If one per cent of the incident photons produce photo electrons, then the

number of photo electrons, then the number of photo electrons emitted from an area of 1.0 $cm^2$ of the surface is nearly

a $19.61 \times 10^{14} s^{-1}$ b $4.12 \times 10^{-13} s^{-1}$

c $1.51 \times 10^{12} s^{-1}$ d $2.13 \times 10^{11} s^{-1}$

39. An X-ray tube operated at 50 kV, produces heat at the target at the rate of 796 W. If 0.5% energy of incident electrons striking the target per second will be

a $10^{19}$ b $10^{18}$

c $10^{17}$ d $10^{16}$

40. The masses of two isotopes of chlorine are 34.980 and 36.978. If the radius of the circular path in Bainbridge mass spectrograph corresponding to lighter is 5 cm, the distance between the spots on photographic plate marked by two isotopes will be

a 5.7 cm b 0.57 cm

c 0.57 mm d 0.57 m

41. In the uranium radioactive series, the initial nucleus is $_{92}U^{238}$ and that the final nucleus is $82Pb^{206}$. When uranium nucleus decays to lead the number of $\alpha$-particles and $\beta$-particles emitted are

a 8 $\alpha$, 6 $\beta$ b 6 $\alpha$, 7 $\beta$

c 6 $\alpha$, 8 $\beta$ d 4 $\alpha$, 3 $\beta$

42. A gas of monoatomic hydrogen is bombarded with a stream of electrons that have been accelerated from rest through a potential difference of 12.75 V. In the emission spectrum one cannot observe any line of

a Lyman series b Balmer series

c paschen series d Pfund series

43. The maximum intensity in Young's double slit experiment is $I_0$. Distance between the slits is d = 5$\lambda$,where $\lambda$ is the wavelength of monochromatic light used in the experiment. What will be the intensity of light infront of one of the slits on a screen at a distance D = 10d?

a $I_0$ b $I_0/4$

c $\frac{3}{4} I_0$ d $I_0/2$

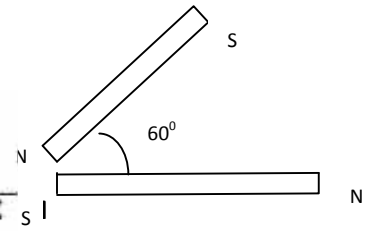
44. A lamp is hanging at a height of 40 m from the centre of a table. If its height is increased by 10 cm, the illuminance on the table will decrease by

a 10% b 20% c 27% d 36%

**45. According to Maxwell's equation, the velocity of light in any medium is expressed as**

a $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ b $\frac{1}{\sqrt{\mu\varepsilon}}$ c $\frac{1}{\sqrt{\mu/\varepsilon}}$ d $\sqrt{\frac{\mu_0}{\varepsilon}}$

**46. Two magnets of equal magnetic moments M each are placed as shown in figure. The resultant magnetic moment is**




a M b $\sqrt{\ }$ S I

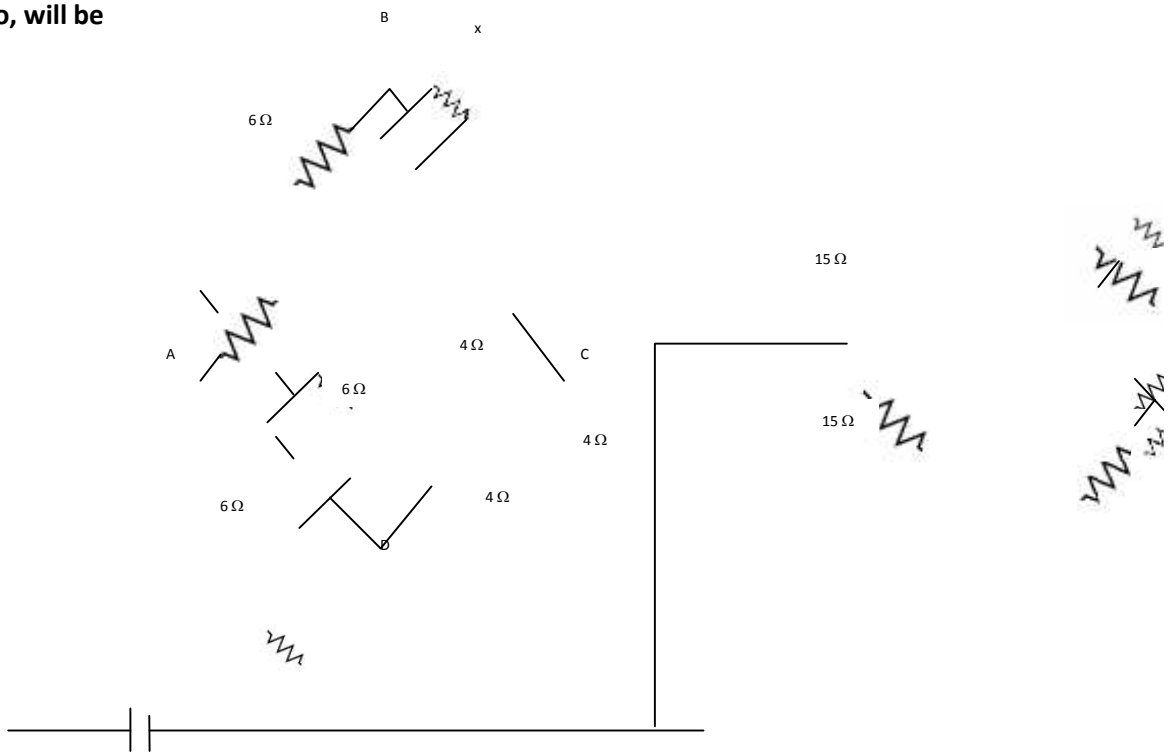
c $\sqrt{2}$M d M/2

**47. The hysteresis cycle for the material of permanent magnet is**

a short and wide b tall and narrow

c tall and wide d short and narrow

**48. In the circuit shown in figure, the value of resistance x, when the potential difference between the points B and D is zero, will be**



a 9 Ω b 8 Ω c 6 Ω d 4 Ω

**49. A mercury drop of radius 1 cm is broken into $10^6$ droplets of equal size. The work done is $\rho = 35 \times 10^{-2}$ N/m**

a $4.35 \times 10^{-2}$ b $4.35 \times 10^{-3}$ J

c $4.35 \times 10^{-6}$ J d $4.35 \times 10^{-8}$ J

**50. A spaceman in training is rotated in a seat at the end of a horizontal rotating arm of length 5m. If he can withstand accelerations upto 9g, then what is the maximum number of revolutions per second permissible?**

Take $g = 10\ m/s^2$

a 13.5 rps
b 1.35 rps
c 0.675 rps
d 6.75 rps

# GGSIPU chemistry 2013

1. The hybridization state of C-atom in butendioic acid is

   a $sp^2$ b $sp^3$

   c Both a and b d sp

2. The oxidation number of C-atom in $CH_2CL_2$ and $CCL_4$ are respectively

   a -2 and -4 b 0 and -4

   c 0 and 4 d 2 and 4

3. Phenolphthalein of pH range8 -10 is used in which of the followi ng type of titration as a suitable indicator?

   a $NH_4OH$ and HCL b $NH_4OH$ and HCOOH

   c $NH_4OH$ and $C_2H_4O_2$ d NaOH and $C_2H_4O_2$

4. Which of the following species has a highest bond energy?

   a $O_2^{2-}$ b $O_2^{+}$ c $O_2^{-}$ d $O_2$

5. Which of the following is a weak acid ?

   a $C_6H_6$ b $CH_3-C\equiv CH$

   c $CH_2=CH_2$ d $CH_3-C\equiv C-CH_3$

6. A mixture containing 60% centane and 40%iso-octane will have

   a centane number 60 b centane number 40

   c octane number 40 d None of these

7. $A \xrightarrow{\text{Alc-KOH}} B \xrightarrow[CCL_4]{2CL_2} C \xrightarrow{CaOH_2} D$

   Here the compound C will be

   a Lewisite
   b Westron
   c Acetylene tetrachloride
   d Both b and c

8. Which of the following is least hydrolysed?

a $BeCL_2$ b $MgCL_2$ c $CaCL_2$ d $BaCL_2$

9. The volume concentration of a 3% solution of hydrogen peroxide would be

a 9880 b 9.88 c 22.4 d 3

10. The energy produced related to mass defeat of 0.02 amu is

a 28.2 MeV b 931.5 MeV

c 18.62 MeV d None of these

11. A solution contains $CL^-$, $I^-$ and $SO_4^{2}$ ions in it. Which of the following ion is capable to precipitate all of above when added in this solution?

a $Pb^{2+}$ b $Ba^{2+}$ c $Hg^{2+}$ d $Cu^{2+}$

12. The minimum number of carbon atoms in ketones which will show chain isomerism

a seven b four c six d five

13. In Victor Mayer's method 0.2g of an organic substance displaced 56 mL of air at STP, the molecular weight of the compound is

a 56 b 112 c 80 d 28

14. $^{14}C_6$ is a beta-active nucleus. A sample of $^{14}CH_4$ gas kept in a closed vessel shows increase in pressure with time. This is due to the

a formation of $^{14}NH_3$ and $H_2$

b formation of $^{14}BH_3$ and $H_2$

c formation of $^{14}C_2$ and $H_2$

d formation of $^{14}CH_3$, $^{14}NH_2$ and $H_2$

15. The bond angle around the central atom iis highest in

a $SO_2$ b $BBr_3$

c $CS_2$ d $SF_4$

16. For a d electron, the orbital angular momentum is

a $\sqrt{6}\frac{h}{2\pi}$ b $\sqrt{2}\frac{h}{2\pi}$

c $\sqrt{6}\frac{h}{2\pi}$ d $\frac{h}{2\pi}$

17. A gaseous mixture of $O_2$ and X containing 20 mole% of X, diffuses through a small hole in 234s while pure $O_2$ take 224s to diffuse through the same hole. The molecular mass of mixture is

a 34.9 b 46.6

c 32 d 44

18. The electronegativity of C,H,O,N and S are 2,5,2,1,3,5,3,0 and 2.5 respectively. Which of following bond is most polar?

a O -H b S -H

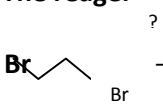
c N -H d C -H

19. ZnS can be existing in the ……structure other than zing blende structure.

a bcc b wurtzite

c simple cubic d rock salt

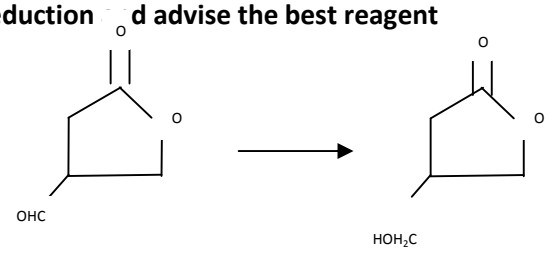
20. The reagents for the following conversion,




$\rightarrow H-C\equiv C-H$ is are

a Alcoholic KOH
b Alcoholic KOH followed by $NaNH_2$
c Aqueous KOH followed by $NaNH_2$
d $Zn/CH_3OH$

21. Consider the following reduction and advise the best reagent



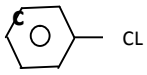

a HI/Red b $LiA/H_4$

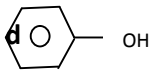
c $NaBH_4$ d Zn -Hg/HCL

22. of the reagents is not used in the preparation of anisole via Williamson's synthesis?

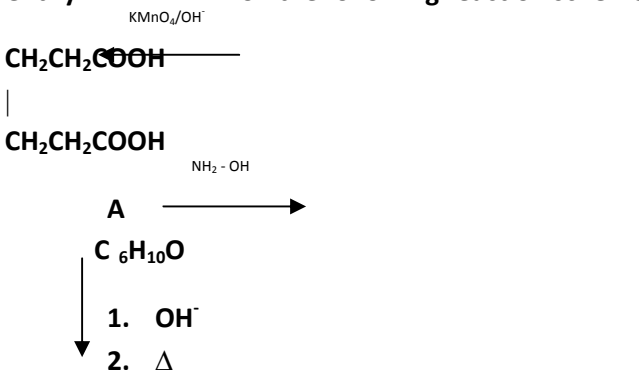
a Na

b $CH_3$—CL

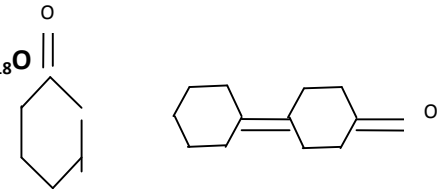
c 

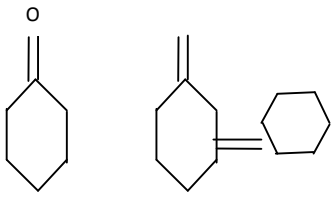

d 

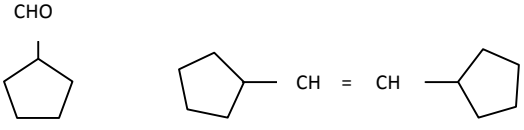

**23. Identify A anB based on the following reaction scheme.**

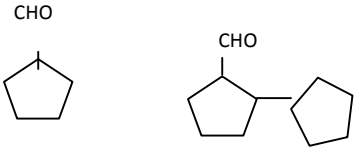



B
$C_{12}H_{18}O$

a 


b 


c 


d 

**24. Which of the following carboxylic acid undergoes decarboxylation easily?**

**a** $C_6H_5-CO-CH_2-COOH$

**b** $C_6H_5-CO-COOH$

**c** $C_6H_5-CO-\underset{\underset{OH}{|}}{COOH}$

**d** $C_6H_5-CO-\underset{\underset{NH_2}{|}}{COOH}$

**25. $CH_3NH_2 + CHCl_3 + KOH \rightarrow$ Nitrogen containing compound is**

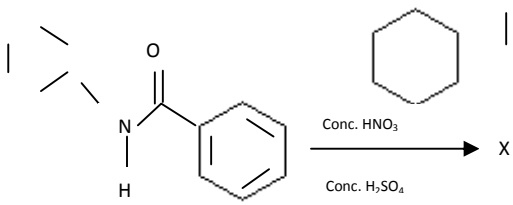
**a** $CH_3-C\equiv N$

**b** $CH_3-NH-CH_3$

**c** $CH_3-\overset{+}{N}\equiv C^-$

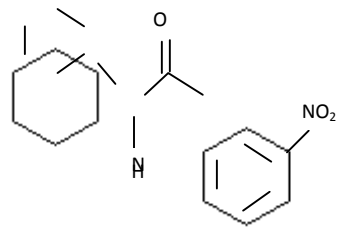
**d** $CH_3-N\equiv C^-$

**26. In the following reaction**

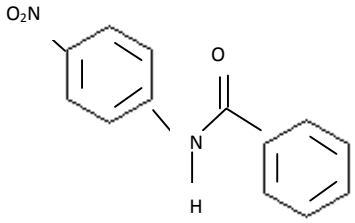



**The structure of the major product X is**

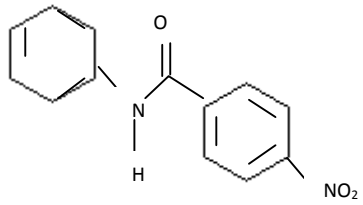
**a**



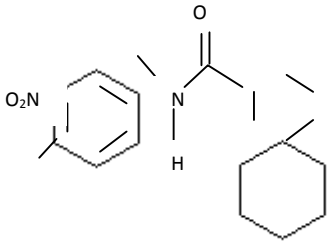
**b**




**c**

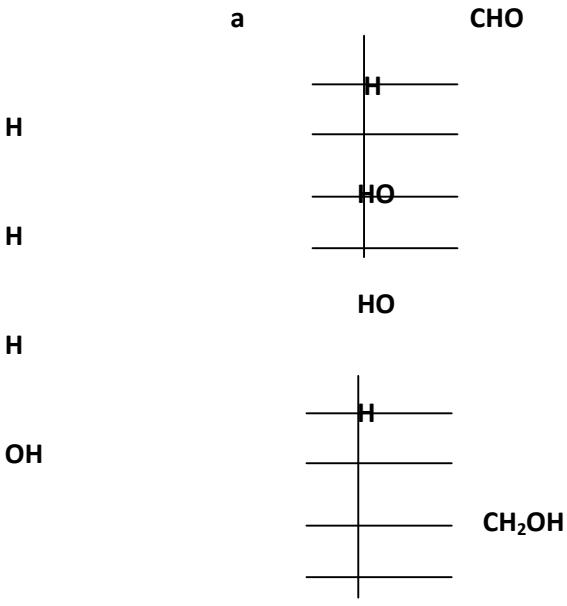



**d**

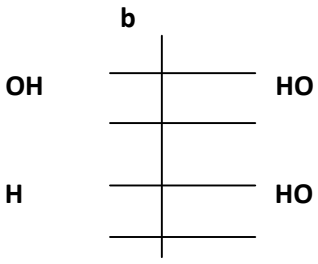



**27. Which of the following monosaccharides yield an optically inactive alditol on $NaBH_4$ reduction?**

**a**

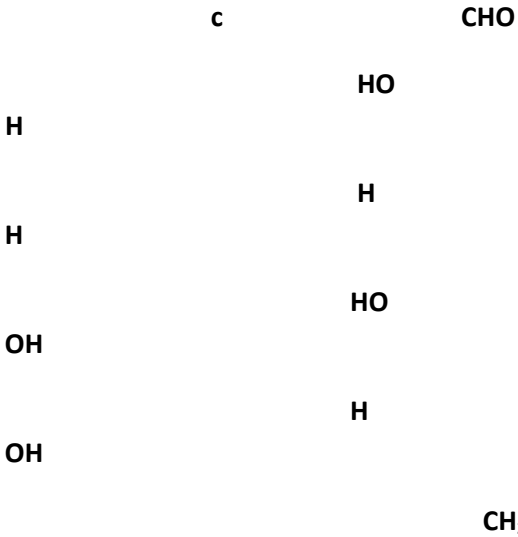



**b**

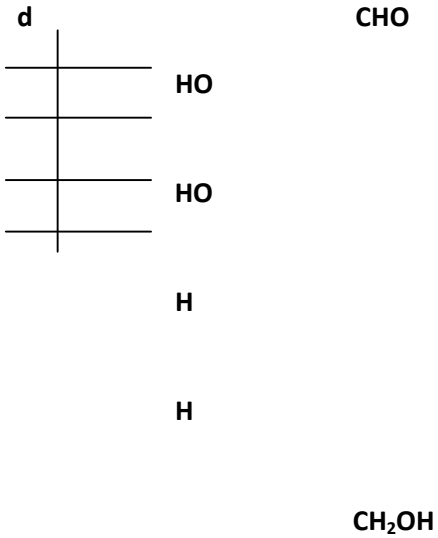



**C**

c




d




28. The monomer melamine has a chemical name

a 2,4,6 - trimino – 1,3,5- trizine

b 1,3,5 – trimino – 2,4,6- trizine

c 2,4 -dimino – 1,3,5- triazine

d 2 – amino – 1,3,5- triazine

29. For the reaction, $N_2O_4$ g $\rightleftharpoons$ 2 $NO_2$ g; the relation connecting the degree of dissociation $\alpha$ of $N_2O_4$g with the equilibrium constant $K_p$ is

a $\alpha = \frac{\frac{K_p}{p}}{4+\frac{K_p}{K_p}}$ b $\alpha = \frac{K_p}{4+K_p}$

c $\alpha = \left(\frac{\frac{K_p}{p}}{4+\frac{K_p}{K_p}}\right)^{1/2}$ d $\alpha = \left(\frac{K_p}{4+K_p}\right)^{1/2}$

30. If the solubility of calcium phosphate mol. Wt = M in water at 25 $^0$C is $\omega$ g/100 mL, its solubility product at 25$^0$C is

a $10^{9}\left(\frac{w}{M}\right)^5$ b $10^{7}\left(\frac{w}{M}\right)^5$

c $10^{5}\left(\frac{w}{M}\right)^5$ d $10^{3}\left(\frac{w}{M}\right)^5$

31. Mass of one atom of an element is $6.64 \times 10^{-23}$ g. This is equal to

a $6.64 \times 10^{23}$ u b 40.0 u

c $\frac{1}{40}$ u  d 6.64 u

32. Sulphide ores of metals are usually concentrated by froth floatation process. Which one of the following sulphide ores offers an exception and is concentrated by chemical leaching?

a Argentite  b Galena

c Copper pyrite  d Sphalerite

33. Soldiers of Napolean army which at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniforms. White metallic tin buttons got covered by grey powder. This transformation is related to

a an interaction with nitrogen of the air at very low temperatures

b a change in the partial pressure of oxygen i n the air

c a change in the crystalline structure of tin

d an interaction with water vapour contained in the humid air

34. Which of the following is a mixed oxide?

a Fe $_2O_3$  b PbO $_2$

c BaO $_2$  d pb $_3O_4$

35. If the quantum numbers for the 5$^{th}$ electron in carbon atom are 2,1,1, + $\frac{1}{2}$, then for the 6$^{th}$ electron, these values would be

a 1,1,0, $\frac{1}{2}$  b 2,0,1,+$\frac{1}{2}$

c 2,1,1 -$\frac{1}{2}$  d 2,1 -1,+$\frac{1}{2}$

36. For the homogenous reaction.

$4NH_3 + 5O_2 \rightleftharpoons 4NO + 6\ H_2O$

The equilibrium constant $K_c$ has the units

a Conc,$^{+10}$
b Conc, $^{+1}$
c Conc, $^{-1}$
d It is dimensionless

37. Which of the following behavior binary liquid solution?

a Plot of 1/ $\rho_{total}$ vs $1/Y_A$ mole fraction of A in vapour phase is linear

b plot of 1/ $\rho_{total}$ vs $1/y_B$ is linear

c plot of 1/ $\rho_{total}$ vs $1/y_A\ y_B$ is linear

d plot of 1/ $\rho_{total}$ vs $y_A$ is linear

38. A 0.004 M solution of $Na_2SO_4$ is isotonic with a 0.010 M solution of glucose at the $25^0$C. The apparent degree of dissociation of $Na_2SO_4$ is

a 25% b 50% c 75% d 85%

39. Cow milk an example of neutral emulsion is stabillised by

a fat b water

c casein d $Mg^{2+}$ ions

40. The initial concentration of sugar solution is 0.12 M. On doing fermentation the concentration of sugar decreases to 0.06 M in 10 h and to 0.045 M to 15 h. The order of the reaction is

a 0.5 b 1.0 c 1.5 d 2.0

41. An athlete is given 100 g of glucose $C_6H_{12}O_6$ of energy equivalent to 1560 kJ. He utilizes 50% of this gained energy in a n event. In order to avoid storage of energy in the body what is the weight of water he would need to perspire ? The enthalpy of evaporation of water is 44 kJ/mol.

a 319 g b 638 g c 14040 g d 35.45 g

42. Which of the following relationship is incorrect ?

a $\frac{\Delta H - \Delta E}{\Delta n\ xT}$ = constant b $\Delta G = -T\Delta S_{Total}$

c $q = \Delta U + W$ d $K = e^{-\Delta G^0}/RT$

43. A mixture of gases having different molecular weights is separated by which method ?

a Atmolysis b Metathesis

c Ostwald and Walker method

d Reverse osomosis

44. Boric acid is polymeric due to

a its acidic nature

b the presence of hydrogen bonds

c i ts monobasic nature

d its geometry

45. The metal ion which does not form coloured compound is

a chromonium b iron

c zinc d manganese

46. The type of isomerism present in pentaamine nitro cobalt III chloride is

a optical b linkage

c ionization d polymerizati on

47. Which of the following is known as invert soap?

a Pentaeryth ritol monostearate

b Sodium stearyl sulphate

c Trimethlsteary ammonium brom ide

d Ethoxylated nonyphenol

48. The cell constant is the

a resistance x conductance

b resistance x specific conductance

c conductance x specific resistance

d resistance x specific resistance

49. It has been found experimentally that if standard reduction potential of oxidant – standard reduction potential of reductant is more than 1.7V then their combination lead to explosion though it may be prevented by kinetic factors.

Now go through the following data and answer the questions.

$E^0_{Ag^+/Ag} = 0.80$ V

$E^0_{ClO^-_4/ClO^-_3} = 1.23$ V

$E^0_{Fe^{3+}/Fe^{2+}} = 0.77$ V

$E^0_{MnO^-_4/Mn^{3+}} = 1.54$ V

$E^0_{N_2/N_3^-} = -3.09$ V

$E^0_{Na^+/Na} = -2.17$ V

$E^0_{O_2/H_2O_2} = -1.03$ V

**Which of the following ionic combinations may lead to the formation of explosive substance?**

a Sodium ion and azide ion
b Silver ion and perchlorate ion
c Silver ion and azide ion
d All the above

**50. For the reasction 2A + B→ product; doubling the initial concentrations of both reactants increase the rate by a factor of 8 and doubling the concentration of B above doubles the rate. The rate law for for the reaction is**

a $r = k[A][B]^2$

b $r = k[A][B]$

c $r = k[A]^2[B]^2$

d $r = k[A]^2[B]$

# GGSIPU mathmatics 2013

**1. Concentric circles of radii 1,2,3,……,100 cm are drawn. The interior of the smallest circle is coloured red and the angular regions are coloured red and the angular regions are coloured alternately green and red, so that no two adjacent regions are of the same colour. The total area of the green region in sq.cm is equal to**

**a** $1000\ \pi$ **b** $5050\ \pi$

**c** $4950\ \pi$ **d** $5151\ \pi$

**2. The value of a for which the quadratic equation**

$3x^2 + 2a^2 + 1\,x + a^2 - 3a + 2 = 0$

**Possesses roots of opposite signs lies in**

**a** $-\infty, 1$

**b** $(-\infty\ 0)$

**c** $(1,2)$

**d** $\left(\frac{3}{2}, 2\right)$

**3. If $2z_1 - 3z_2 - z_3 = 0$, then $z_1, z_2$ and $z_3$ are represented by**

**a three of a triangle**

**b three collinear points**

**c three vertices of a rhombus**

**d None of the above**

**4. The term independent of x,in the expension of $\left(1 + \frac{1}{x} + x + x^2\right)^4$ is**

**a 35 b 30 c 32 d 31**

**5. The number of six-digit numbers which have sum of their digits as an odd integer, is**

**a 45000 b 450000**

**c 97000 d 970000**

**6. Consider the $\Delta$ AOB in the x,y-plane where A $\equiv$ 1,0,0, B $\equiv$0,0,0. The new position of O, when triangle is rotated about side AB by $90^0$ can be**

**a** $\left(\frac{4}{5}, \frac{3}{5}, \frac{2}{\sqrt{5}}\right)$

b $\left(\frac{-3}{5}, \frac{\sqrt{2}}{5}, \frac{2}{\sqrt{5}}\right)$

c $\left(\frac{4}{5}, \frac{2}{5}, \frac{2}{\sqrt{5}}\right)$

d $\left(\frac{4}{5}, \frac{2}{5}, \frac{1}{\sqrt{5}}\right)$

**7. Number of planes which are at a given perpendicular distance from a given point and passing through a given point is**

a 0 b 2 c 4 d infinite

**8. If A and B are two independent events, then which of the following is not equal to any of the remaining?**

a $PA' \cap B' - P A \cap B$

b $PA' + PB' - 1$

c $PB - PA'$

d $PB' - PA$

**9. In $u_n = 2 \cos n\theta$ and $u_1 u_n - u_{n-1}$ is equal to**

a $u_{n-2}$ b $u_{n+1}$

c 0 d) None of these

**10. If $\frac{1}{\sqrt{2}} < x < 1$, then $\cos^{-1} x + \cos^{-1}\left(\frac{x+\sqrt{1-x^2}}{\sqrt{2}}\right)$ is equal to**

a $2\cos x^{-1}$ b $2\cos^{-1} x$

c $\frac{\pi}{4}$ d 0

**11. The number of values of $\theta$ satisfying $4\cos\theta + 3\sin\theta = 5$ as well as $3\cos\theta + 4\sin\theta = 5$ is**

a 1 b 2

c 0 d None of these

**12. A kite is flying with the string inclined at $75^0$ to the horizon. If the length of the string is 25 m, then height of the kite is**

a $\left(\frac{25}{2}\right)(\sqrt{3} - 1^2$ b $\left(\frac{25}{2}\right)(\sqrt{3} + 1\sqrt{2}$

c $\left(\frac{25}{2}\right)(\sqrt{3} + 1^2$ d $\left(\frac{25}{2}\right)(\sqrt{6} + \sqrt{2}$

13. The ends of a quadrant of a circle have the coordinates 1,3 and 3,1. Then, the centre of circle is

a 2,2 b 1,1

c 4,4 d 2,6

14. If the latus rectum of the parabola $2x^2-ky+2=0$ be 2, then the vertex is

a $\left(0,\frac{3}{4}\right)$ b $\left(0,\frac{3}{2}\right)$

c $\left(\frac{3}{4},0\right)$ d 0,0

15. If f: 3,4 $\rightarrow$ 0,1 is defined by f(x = x – [x], where [x] denotes the greatest integer function, then f'x is

a $\frac{1}{x-[x]}$ b [x] – x

c) x-3 d x+3

16. If f(x = $\cos^{-1}\frac{x-x^{-1}}{x+x^{-1}}$ then f' -2 is

a $\frac{2}{5}$ b $\frac{-2}{5}$

c $-\frac{1}{5}$ d None of these

17. Let f(x be an even function in R. If f(x is monotonic increasing in [2,6], then

a f3 > f( -5 b f -2 < f2

c) f(-2> f2 d f( -3<ff( ;)

18. If $\int_{a-n}^{n} e^{x\ a-x)}dx = \lambda$, then the value of $\int_{a}^{n} xe^{x\ a-x)}dx$, $a \neq 2n$, is

a $\frac{a\lambda}{2}$ b a $\lambda$

) 2a2aλ d None of these

19. If I = $\int_{1/\pi}^{\pi}\frac{1}{x}$. Sin $\left(x-\frac{1}{x}\right)$ dx, then I is equal to

a 0 b $\pi$ c $\pi-\frac{1}{\pi}$ d $\pi+\frac{1}{\pi}$

20. The number of sides of the quadrilateral whose joint equation is $x^2y^2 + 1 = x^2 + y^2$, and which are touched by the circles $x^2 + y^2 = 2x$ is

a 4 b 3 c 2 d 1

21. If f(x+2 = $\frac{1}{2}$ {fx+1 + $\frac{4}{f'x}$} and f(x > 0, for all x $\in$ R, then $\lim_{x\to\infty} f(x)$ is

a 1 b 2 c -2 d 0

22. Let f(x be a continuous function whose range is [2,6,5]. If hx = $\left[\frac{\cos x+f(x)}{\lambda}\right]$, $\lambda \in$ N be continuous, where [.] denotes the greatest integer function, then the least value of $\lambda$ is

a 6 b 7

(c) d None of these

23. $\int \frac{3+2\cos x}{2+3\cos x)^2}$. dx is equal to

a $\left(\frac{\sin x}{2+3\cos x}\right)$ + c

b $\left(\frac{\sin x}{2+3\sin x}\right)$ + c

c Both a and b

d None of the above

24. Differential equation of the family of circles touching the line y = 2 at 0,2 is

a x $^2$ + y -2 $^2$ + $\frac{dy}{dx}$(y-2)= 1

b x $^2$ + y -2 $\left(2-2x\frac{dx}{dy}-y\right)=0$

c x $^2$ + y -2 $^2$ + $\left(\frac{dx}{dy}+y-2\right)$ (y-2 = 0

d None of the above

25. If a,b and c are non -zero real numbers and az$^2$+bz+c+I = 0 has purely imaginary roots,then a is equal to

a bc b b $^2$c c -b$^2$c d $\frac{1}{2}$b$^2$c

26. If a,b and c are three mutually orthogonal unit vectors, then the triple product [a+b+c a+b b+c] is equal to

a 0 b 1 or -1 c 1 d 3

27. y$^2$ = 4x is a curve and P,Q and r are three points on it, where P = 1,2, Q = $\left(\frac{1}{4},1\right)$ and the tangent to the curve at R is parallel to the chord PQ of the curve, then coordinates of R are

a $\left(\frac{5}{8},\sqrt{\frac{5}{2}}\right)$ (b) $\left(\frac{9}{16},\frac{3}{2}\right)$

c $\left(\frac{5}{8},-\sqrt{\frac{5}{2}}\right)$ d $\left(\frac{9}{16},\frac{-3}{2}\right)$

**28. A batsman can score 0,1,2,3,4 or 6 runs from a ball. The number of different sequences in which he can score exactly +30 runs in an over of six balls, is**

a 4 b 72 c 56 d 7

**29. If x f(y = fx f(y $^2$, $\forall$ x, y $\in$ R and f($\sqrt{3}$ + f $\sqrt{5}$ = 4, then f' $\sqrt{3}$ is equal to**

a 1 b $\sqrt{3}$ c - $\sqrt{3}$ d 1

**30. The number of solutions for the equation $2\sin^{-1}\sqrt{(x^2-x+1}$ + $\cos^{-1}\sqrt{(x^2-x}$ = $\frac{3\pi}{2}$ is**

a 1 b 2 c 3 d iInfiniinite

**31. The number of solutions of the equation $\int_{-2}^{x}|\cos x|\,dx = 0$, $0<x<\frac{\pi}{2}$, is**

a 0 b 1 c 2 d 4

**32. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is $60^0$, when he retires 40m from the bank he finds the angle to $30^0$. The breadth of river is**

a 40 m b 60 m

c 20 m d 30 m

**33. Two circles $x^2+y^2-2kx = 0$ and $x^2+y^2-4x-8y+16 = 0$ touch each other externally. Then , k is**

a 4 b 1

b 2 d -4

**34. If the line ax+by = 2 is a normal to the circle $x^2+y^2-4x-4y = 0$ and a tangent to the circle $x^2+y^2 = 1$, then**

a a = $\frac{1}{2}$, b = $\frac{1}{2}$

b a = $\frac{1+\sqrt{7}}{2}$, b = $\frac{1-\sqrt{7}}{2}$

c a = $\frac{1}{4}$, b = $\frac{3}{4}$

d a = 1, b = $\sqrt{3}$

35. The graph of the curve $x^2+y^2-2xy-8x-8y+32 = 0$ falls wholly in the

a first quadrant b second quadrant

c third quadr ant d Nopne othese

36. The number of solutions [cos x] + $|\sin x|$ = 1 in $\pi \leq x < 3\pi$ is

a 3 b 4 c 2 d 1

37. The slope of the tangent to the curve tan y = $\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}$ at x = $\frac{1}{2}$ is

a $\frac{1}{\sqrt{3}}$ b $\sqrt{3}$

c 1 d $\frac{1}{2}$

38. If the real val;ued function f(x = $x^3+3a^2-1x+1$ be invertible, then set of possible real values of a is

a $-\infty, -1 \cup 1, \infty$ b -1,1

c [ -1,1] (d) $(-\infty, -1] \cup 1, +\infty$

39. The value of $\int_0^{\pi/4} \frac{\sec x}{\sec x+\tan x)^2}$ . dx is

a 1+ $\sqrt{2}$ b -11+ $\sqrt{2}$

c -$\sqrt{2}$ d None of these

40. The combined equation of straight lines that can be obtained by reflecting the lines y = [x-2] in the y-axis is

a $y^2+x^2+4x+4 = 0$

b $y^2+x^2-4x+4 = 0$

c $y^2-x^2+4x-4 = 0$

(d) $y^2-x^2-4x-4 = 0$

41. $\lim_{x\to 0}\left\{(1+x)^{\frac{2}{x}}\right\}$, where {.} denotes the fractional part of x,is equal to

a $e^2-7$ b $e^2-8$

c) $e^2 - 6$ (d) None of tese

42. fx = $\begin{cases} e^{-1/x^2} , & x > 0 \\ 0 , & x \le 0 \end{cases}$ , then f(x is

a differential at x =0

b continuous but not differentiable at x =0

c discontinuous a t x =0

d )None of the above

43. $\int \frac{1}{x^2 (x^4+1)^{3/4}} dx$ is equal to

a $\left(1+\frac{1}{x^4}\right)^{1/4} + C$ b $\left(x^4+1\right)^{1/4} + C$

c $\left(1-\frac{1}{x^4}\right)^{1/4} + C$ d $-\left(1+\frac{1}{x^4}\right)^{1/4} + C$

44. The solution of the differential equation (+ $x^2y^2$ y dx + $x^2y^2$ - 1 xdy = 0 is

a xy = log $\frac{x}{y}$ + C b xy =2 log $\frac{y}{x}$ + C

c x $^2y^2$ = 2 log $\frac{y}{x}$ + C d None of these

45. Equation of chord of contact of pair of tangents, drawn to ellipse $4x^2+9y^2 = 36$ from the point m,n, where m.n = m+n, m,n being non -zero positive integers,is

a 2x+9y = 18 b 2x+2y = 1

c 4x+9y = 18 d None of these

46. The equation to the hyperbola of given transverse axis whose vertex bisects the distance between the centre and focus, is given by

a $3x^2-y^2 = 3a^2$ b $x^2-3y^2 = a^2$

c x $^2-y^2 = 3a^2$ d None of these

47. The plane ax-by-cz = d will contain the line $\frac{x-a}{a} = \frac{y+3d}{b} = \frac{z-e}{c}$, provided

a b = [0,3 d] b a = [2d]

c c = [3d] d b = [ -3d]

**48.** If z is a complex number lying in the first quadrant such that Rez + Imz = 3, then the maximum values of $[\text{Re } z]^2 \text{ Im } z$ is

a 1 (b) 2 3 (d) 4

**49.** If $A = \tan^{-1}\left(\frac{x\sqrt{3}}{2k-x}\right)$ and $B = \tan^{-1}\left(\frac{2x-k}{k\sqrt{3}}\right)$. Then, A – B is equal to

a $\frac{\pi}{2}$ b $\frac{\pi}{3}$

c $\frac{\pi}{6}$ d None of these

**50.** If in a $\Delta ABC$, $\angle B = \frac{2\pi}{3}$, then the cos A + cos C lies in

a $[-\sqrt{3}, \sqrt{3}]$ (b) $(-\sqrt{3}, \sqrt{3})$

c $\left(\frac{3}{2}, \sqrt{3}\right]$ (d) $\left[\frac{3}{2}, \sqrt{3}\right]$