QUESTION PAPER

Mathematics

1. A team of 3 boys and 2 girls is to be formed from a group of 5 girls and 7 boys. The number of ways of forming terms of two specific boys never come together, is

   (A) 200
   (B) 400
   (C) 250
   (D) 300

2. If α, β are the roots of quadratic equations $x^2 + 2x + 2 = 0$, then the value of $\alpha^{15} + \beta^{15}$ is

   (A) 512
   (B) -512
   (C) 256
   (D) -256

3. Evaluate: $\int_0^{\pi} |\cos|^3 dx$

   (A) $\frac{4}{3}$
   (B) 0
   (C) $\frac{2}{3}$
   (D) $\frac{-8}{3}$

4. If $x^2 \neq n\pi + 1, n \in N$ then $\int x\sqrt{\frac{2\sin(x^2-1)-\sin 2(x^2-1)}{2\sin(x^2-1)+\sin 2(x^2-1)}}dx$ is equal to

   (A) $ln \sec\left(\frac{x^2-1}{2}\right) + c$
   (B) $ln \cos\left(\frac{x^2-1}{2}\right) + c$
   (C) $\frac{1}{2} ln \cos\left(\frac{x^2-1}{2}\right) + c$
   (D) $\frac{1}{2} ln \sec\left(\frac{x^2-1}{2}\right) + c$

5. If $\vec{a} = \hat{\imath} - \hat{\jmath}$, $\vec{b} = \hat{\imath} + \hat{\jmath} + \hat{k}$ are two vectors and $\vec{c}$ is another vector such that $\vec{a} \times \vec{c} = \vec{b}$ and $\bar{a}.\bar{c} = 0$ then $|\vec{c}|^2 =$

   (A) 3
   (B) $\frac{3}{2}$
   (C) $\frac{7}{2}$
   (D) $\frac{17}{2}$

6. $f(x) = \begin{cases} 5; x \leq 1 \\ a + bx; 1 < x < 3 \\ b + 5x; 3 \leq x < 5 \\ 30; x \geq 5 \end{cases}$ then

(A) $f(x)$ is discontinuous $\forall a \in R, b \in R$
(B) $f(x)$ is continuous if $a = 5$ & $b = 0$
(C) $f(x)$ is continuous $a = 0$ & $b = 5$
(D) $f(x)$ is continuous if $a = -5$ & $b = 10$

7. Mean and variance of heights of 5 students in a class is 150 and 18 respectively. A new student whose height is 156 is added to the group. Then the new variance of the class is
(A) 20
(B) 14
(C) 16
(D) 22

8. If a, b, c are in $G.P.$ $a + b + c = xb$, then the value of x can not be
(A) 2
(B) 3
(C) -2
(D) 4

9. If $\left\{\frac{2^{403}}{15}\right\} = \frac{k}{15}$, where $\{.\}$ represents fractional part of a real number, then the value of k is
(A) 4
(B) 8
(C) 1
(D) 2

10. Evaluate the limit, $\lim_{y \to 0} \frac{\sqrt{1+\sqrt{1+y^4}}-\sqrt{2}}{y^4}$
(A) $\frac{1}{2\sqrt{2}}$
(B) $\frac{1}{2\sqrt{2}(1+\sqrt{2})}$
(C) $\frac{1}{4\sqrt{2}}$
(D) does not exist

11. There is a parabola having axis as x −axis, its vertex is at a distance of 2 unit form origin and its focus is at $(4, 0)$. Which of the following point does not lie on the parabola?
(A) $(6, 8)$
(B) $(8, 4\sqrt{3})$
(C) $(5, 2\sqrt{6})$
(D) $(4, -4)$

12. The sum of all possible values of θ in the interval $\left(-\frac{\pi}{2}, \pi\right)$ for which $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely imaginary, is

(A) π
(B) $\frac{\pi}{3}$
(C) $\frac{2\pi}{3}$
(D) $\frac{\pi}{2}$

13. If $A = \begin{bmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{bmatrix}$. then the value of A^{-50} at $\theta = \frac{\pi}{12}$ is

(A) $\begin{bmatrix}-\frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2}\end{bmatrix}$
(B) $\begin{bmatrix}\frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{-1}{2} & \frac{\sqrt{3}}{2}\end{bmatrix}$
(C) $\begin{bmatrix}-\frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{-1}{2} & \frac{\sqrt{3}}{2}\end{bmatrix}$
(D) $\begin{bmatrix}\frac{1}{2} & \frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{-1}{2}\end{bmatrix}$

14. If $(A \oplus B) \wedge (\sim A \ominus B) = A \wedge B$ is true always proper symbol in place of $\oplus$ and $\ominus$ must be

(A) $\wedge$ and $\vee$
(B) $\vee$ and $\vee$
(C) $\wedge$ and $\wedge$
(D) $\vee$ and $\wedge$

15. If $y(x)$ is solution of $x\frac{dy}{dx} + 2y = x^2, y(1) = 1$ then value of $y\left(\frac{1}{2}\right) =$

(A) $\frac{45}{8}$
(B) $\frac{49}{16}$
(C) $-\frac{49}{16}$
(D) $-\frac{45}{8}$

16. From a well shuffled deck of cards, 2 cards are drawn with replacement. If x represent numbers of times ace coming, then value of $P(x = 1) + P\ (x = 2)$ is

(A) $\frac{25}{169}$
(B) $\frac{49}{169}$

(C) $\frac{23}{169}$
(D) $\frac{24}{169}$

17. If eccentricity of the hyperbola $\frac{x^2}{\cos^2\theta} - \frac{y^2}{\sin^2\theta} = 1$ is more than 2 when $\theta \in \left(0, \frac{\pi}{2}\right)$. The possible values of length of latus rectum of the hyperbola are
(A) $(3, \infty)$
(B) $(2, 3)$
(C) $(-3, -2)$
(D) $(1, 3/2)$

18. If slant height of a right circular cone is $3\ cm$ then the maximum volume of cone is
(A) $4\sqrt{3}\,\pi\ cm^3$
(B) $\left(2+\sqrt{3}\right)\pi\ cm^3$
(C) $2\sqrt{3}\,\pi\ cm^3$
(D) $\left(2-\sqrt{3}\right)\pi\ cm^3$

19. If $\cos^{-1}\left(\frac{2}{3x}\right) + \cos^{-1}\left(\frac{3}{4x}\right) = \frac{\pi}{2}, x > \frac{3}{4}$ then $x =$
(A) $\frac{\sqrt{146}}{11}$
(B) $\frac{\sqrt{145}}{11}$
(C) $\frac{\sqrt{145}}{12}$
(D) $\frac{\sqrt{146}}{10}$

20. If $px + qx + r = 0$ represent a family of straight lines such that $3p + 2q + 4r = 0$ then
(A) All lines are inconsistence
(B) All lines are parallel
(C) All lines are concurrent at $\left(\frac{3}{4}, \frac{1}{2}\right)$
(D) All lines are concurrent at $(3, 2)$

21. Consider the system of equations $x + y + z = 1, 2x + 3y + 2z = 1, 2x + 3y + (a^2 - 1)z = a + 1$ then
(A) system has a unique solution for $|a| = \sqrt{3}$
(B) system is inconsistence for $|a| = \sqrt{3}$
(C) system is inconsistence for $a = 3$
(D) system is inconsistence for $a = 4$

22. If $\theta \in \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$ then the value of $3(\cos\theta - \sin\theta)^4 - = +6(\sin\theta + \cos\theta)^2 + 4\sin^6\theta$ is
(A) $13 - 4\cos^6\theta + 2\sin^4\theta\cos^2\theta$
(B) $13 - 4\cos^6\theta$
(C) $13 - 4\cos^4\theta$
(D) $13 - 4\cos^4\theta + 2\sin^4\theta\cos^2\theta$

23. 3 circles of radii $a, b, c, (a < b < c)$ touch each other externally and have x-axis as a common tangent then
(A) $\sqrt{a}, \sqrt{b}, \sqrt{c}$ are in $A.P.$
(B) a, b, c are in A.P.
(C) $\frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}} + \frac{1}{\sqrt{c}}$
(D) $\frac{1}{\sqrt{c}} + \frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}}$

24. If $f(x) = \frac{1}{x}, f_2(x) = 1 - x, f_3(x) = \frac{1}{1-x}$ then find $J(x)$ such that $f_2\ o\ j\ o\ f_1(x) = f_3(x)$
(A) $\frac{1}{x} f_3(x)$
(B) $f_1(x)$
(C) $f_3(x)$
(D) $f_2(x)$

25. Find the equation of line through $(-4, 1, 3)$ & parallel to the plane $x + y + z = 3$ while the line intersects another line whose equation is $x + y - z = x + 2y - 3z + 5$
(A) $\frac{x+4}{1} = \frac{y-1}{2} = \frac{z-3}{-3}$
(B) $\frac{x+4}{-3} = \frac{y-1}{-2} = \frac{z-3}{1}$
(C) $\frac{x+4}{-3} = \frac{y-1}{2} = \frac{z-3}{1}$
(D) $\frac{x+4}{-1} = \frac{y-1}{2} = \frac{z-3}{-3}$

26. Consider the curves $y = x^2 + 2$ and $y = 10 - x^2$. Let θ be the angle between both the curves at point of intersection, then find $|\tan\theta|$
(A) $\frac{8}{15}$
(B) $\frac{8}{17}$
(C) $\frac{3}{17}$
(D) $\frac{5}{17}$

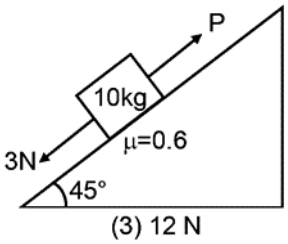
27. A plane parallel y-axis passing through line of intersection of planes $x + y + z$ & $2x + 3y - z - 4 = 0$ which of the point line on the plane
(A) $(-3, 1, 1)$
(B) $(3, 2, 1)$
(C) $(-3, 0, 1)$
(D) $(3, -1, 1)$

28. Find common tangent of the two curve $y^2 = 4x$ and $x^2 + y^2 - 6x = 0$
(A) $y = \left(\frac{x}{\sqrt{3}} - \sqrt{3}\right)$
(B) $y = \frac{x}{3} + 3$
(C) $y = \frac{x}{3} - 3$
(D) $y = \left(\frac{x}{\sqrt{3}} + \sqrt{3}\right)$

29. If the area bounded by the curve $y = x^2 - 1$ tangent to it at $(2,3)$ and y-axis is
(A) $\frac{4}{3}$
(B) $\frac{2}{3}$
(C) $\frac{8}{3}$
(D) 1

Physics

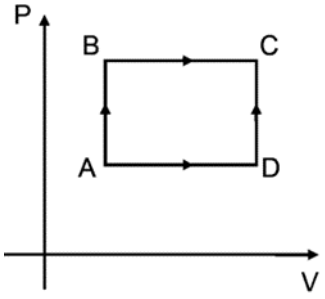
1. A block of mass 10 kg is kept on a rough inclined plane as shown in the figure. The coefficient of friction between the block and the surface is 0.6. Two forces of magnitude 3N and P Newton are acting on the block. If friction on the block is acting upwards then minimum value of P for which the block remains at rest is:



(3) 12 N

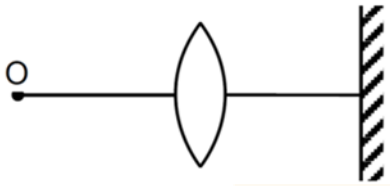
(A) 32 N
(B) 12 N
(C) 64 N
(D) 3 N

2. For path ABC, Heat given to the system is 60 J and work done by the system is 30 J. For path ADC, work done by the system is 10J. The heat given to the system for path ADC is



(A) 60 J
(B) 80 J
(C) 40 J
(D) 100 J

3. An object O is kept initially at a distance of 10 cm from the convex lens and a sharp image is formed at 10 cm ahead of lens on the screen. Now a glass plate of refractive index $\mu = 1.5$ and thickness 1.5 cm is placed between object and lens. The distance by which the screen should be shifted to get sharp image on the screen will be



(A) 5 cm

(B) $\frac{5}{9} cm$

(C) 1 cm

(D) $\frac{9}{5} cm$

4. A planet of mass m having angular momentum L is revolving around the sun. The aerial velocity of the planet will be

(A) $\frac{L}{m}$

(B) $\frac{2L}{m}$

(C) $\frac{L}{4m}$ m

(D) $\frac{L}{2m}$

5. The velocity of a particle $\vec{v}$ at any instant is $\vec{v} = y\hat{i} + x\hat{j}$. The equation of trajectory of the particle is:

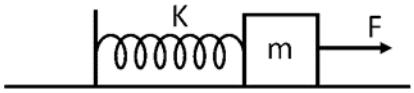
(A) $y^2 = x^2 +$ constant

(B) $x^2 + y^2 =$ constant

(C) $xy =$ constant

(D) None of these

6. Initially block of mass m is at rest on a frictionless floor and the spring is in relaxed condition. A constant force is applied on the block as shown in figure. The maximum velocity of block is:



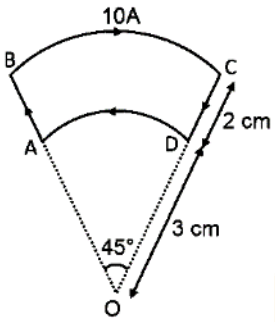
(A) $\frac{F}{\sqrt{mK}}$

(B) $\frac{F}{2\sqrt{mK}}$

(C) $\frac{F}{\sqrt{2mK}}$

(D) $\frac{2F}{\sqrt{mK}}$

7. A loop ABCD has current $I = 10$ A as shown in the figure. AD and BC are circular arc with centre at O for both. The magnetic field at point O is.



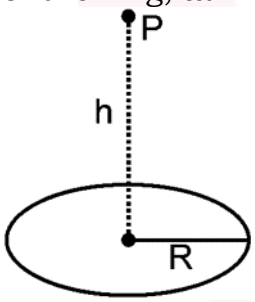
(A) 10^{-4} T

(B) 10^{-5} T

(C) 1.5×10^{-5} T

(D) 2×10^{-5} T

8. Charge Q is uniformly distributed over a ring of radius R. The height h, on the axis of the ring, at which electric field is maximum is



(A) R

(B) $\frac{R}{2}$

(C) $\frac{R}{\sqrt{2}}$

(D) None of these

9. Two radioactive elements A & B have initial activities 10 curie & 20 curie respectively. If A has twice the number of moles as that of B, the decay constant λ_A & λ_B can be

(A) $(5, 20)$

(B) $(20, 10)$

(C) $(10, 5)$

(D) $(50, 100)$

10. A conducing loop of resistance 10Ω and area $3.5 \times 10^{-3} m^2$ is placed in uniform and time varying magnetic field $B = 0.4 \sin(50\pi t)$. The charge passing through the loop in $t = 0$ to $t = 10\, ms$ is:

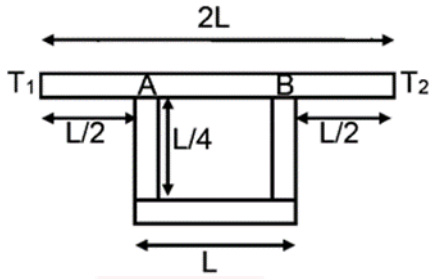
(A) 140 μC

(B) 280 μC

(C) 100 μC
(D) 70 μC

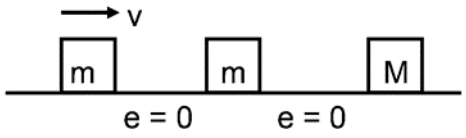
11. If current in a current carrying wire is 1.5A, number of free electrons per unit volume is $8 \times 10^{28}\ m^3$ and area of cross section is $5\ mm^2$. Drift velocity of electrons will be
(A) $0.02\ mm/s$
(B) $0.2\ mm/s$
(C) $2\ mm/s$
(D) None of these

12. Rods are made of same material and have same cross sectional area and are joined as shown in the figure. The two ends are at temperatures T_1 and T_2. If temperature difference $T_1 - T_2$ is $120°C$. The temperature difference between points A & B is



(A) 45
(B) 30
(C) 75
(D) 60

13. Three blocks of masses m, m and M are kept on a frictionless floor as shown in figure. The left most block is given velocity v towards right. All the collisions between the blocks are perfectly inelastic. The loss in kinetic energy after all the collisions is $5/6^{th}$ of initial kinetic energy. The ratio of M/m will be:



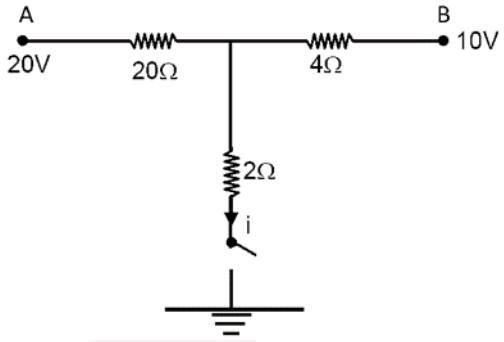
(A) $\frac{1}{4}$
(B) $\frac{1}{8}$
(C) 2
(D) 4

14. In a mixture 2 mole of He and 1 mole of Ar is present. Find $\frac{(V_{RMS})_{He}}{(V_{RMS})_{Ar}}$ at $300\ K$.
(A) 10
(B) 6.32

(C) 3.16
(D) 1.58

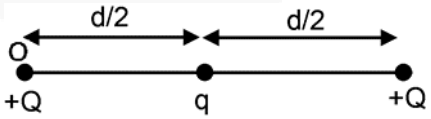
15. Light of wavelengths $\lambda_1 = 340\,nm$ and $\lambda_2 = 540\,nm$ are incident on a metallic surface. If the ratio of the speeds of the electrons ejected is 2, the work function of the metal is
(A) 2 eV
(B) 1.85 eV
(C) 1 eV
(D) 1.5 eV

16. In the circuit shown point A and point B are at potentials 20V and 10V respectively. After the switch is closed the value of current through the switch is



(A) 1 A
(B) 5 A
(C) 2 A
(D) 10 A

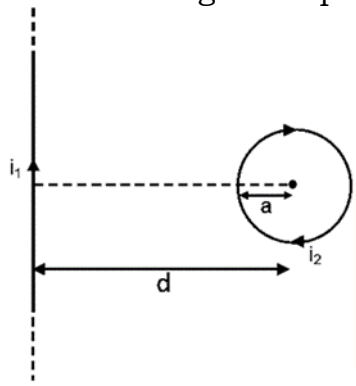
17. A point charge q is at the centre of the two identical charges Q as shown in the figure. If net force on charge kept at O is zero. The value of charge q is:



(A) $+\frac{Q}{4}$
(B) $+\frac{Q}{2}$
(C) $-\frac{Q}{2}$
(D) $-\frac{Q}{4}$

18. If value of electric field for an electromagnetic wave is $E = 6.3 \times 10^{27}\,volt/m$, then the value of magnetic field B will be:
(A) $2.1 \times 10^{20} T$
(B) $2.1 \times 10^{19} T$
(C) $5 \times 10^{-29} T$
(D) $5 \times 10^{-19} T$

19. A current carrying circular loop of radius a is placed at a distance d from a straight infinite current carrying wire. Both are in the same plane
Given, $d >>> a$
If force acting on loop is F then:

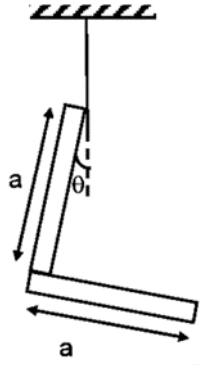


(A) 0
(B) $F \propto \left(\frac{a}{d}\right)^2$
(C) $F \propto \left(\frac{a}{d}\right)$
(D) $F \propto \left(\frac{a^2}{d}\right)$

20. Two coherent light sources having intensity I_1 and I_2 are used for YDSE.
I_{max} *and* $I_{\min}$ be the maximum and minimum intensities. If ratio of $\frac{I_{\max}}{I_{\min}}$ is 16: 1. Find $\frac{I_1}{I_2}$?
(A) $\frac{4}{1}$
(C) $\frac{9}{16}$
(C) $\frac{16}{9}$
(D) $\frac{25}{9}$

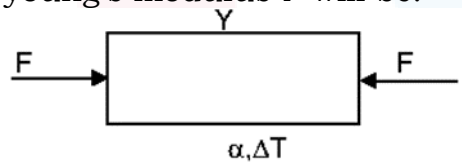
21. If length of resistance wire is increased by 0.5 % keeping the volume constant then change in resistance will be:
(A) 1%
(B) 0 %
(C) 2%
(D) 0.5%

22. A uniform L shaped rod each of side a is held as shown in the figure. The angle θ such that rod remains stable will be.



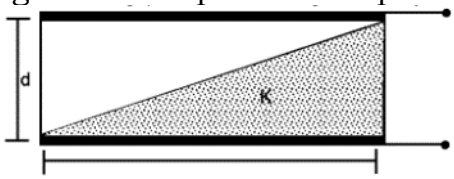
(A) $\tan^{-1}\left(\frac{1}{2}\right)$
(B) $\tan^{-1}\left(\frac{1}{3}\right)$
(C) $\tan^{-1}2$
(D) $\tan^{-1}3$

23. A rod is acted by two equal forces as shown in the figure. The coefficient of thermal expansion of the rod is α and area of cross section is A. When the temperature the rod is increased by ΔT, the length of the rod does not change. The young's modulus Y will be.



(A) $\frac{F}{2A\alpha\Delta T}$
(B) $\frac{2F}{A\alpha\Delta T}$
(C) $\frac{F}{3A\alpha\Delta T}$
(D) $\frac{F}{A\alpha\Delta T}$

24. A capacitor is formed by two square metal-plates of edge a, separated by a distance d. Dielectric of dielectric constants K is filled in the gap as shown in the figure. The equivalent capacitance is



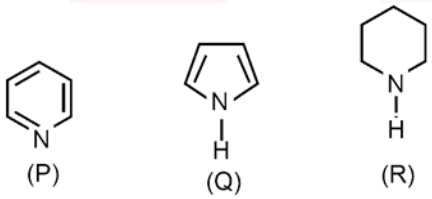
(A) $\frac{K\varepsilon_0 a^2\, ln K}{d(K-1)}$
(B) $\frac{K\varepsilon_0 a^2\, ln K}{2d(K-1)}$
(C) $\frac{K\varepsilon_0 a^2\, ln K}{d(K-2)}$
(D) $\frac{K\varepsilon_0 a^2\, ln K}{d(K-1)}$

25. In a semiconductor, mobility of electron, i.e. drift velocity per unit applied electric field is 1.6 (S.$S.I$ unit). Density of electron is $10^{19}/m^3$. (Neglect holes concentration). Resistivity of semi conductor is:
(A) $0.4\ \Omega m$
(B) $4\ \Omega m$
(C) $2\ \Omega m$
(D) $0.2\ \Omega m$

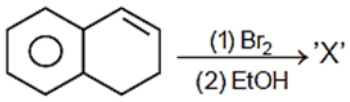
26. A block of mass M is hanging by a string of negligible mass in a car. The speed of wave in the string $60\ m/s$. Now car is accelerated horizontally by an acceleration a the speed of wave in the string is 60.5 m/s. What is a in terms of g?
(A) $\frac{g}{10}$
(B) $\frac{g}{30}$
(C) $\frac{g}{5}$
(D) $\frac{g}{\sqrt{30}}$

Chemistry

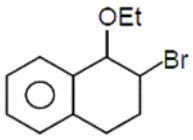
1. Arrange the following in order of k_b value.

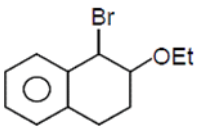


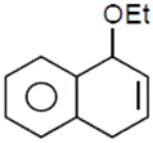
(A) $Q > P > R$
(B) $R > Q > P$
(C) $P > Q > R$
(D) $R > P > Q$

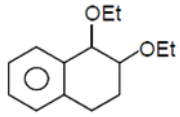
2. 

Product "X" (Major) will be:

(A) 

(B) 

(C) 

(D) 

3. Arrange the following in order of K_a value

$\underset{(P)}{FCH_2COOH}$ $\underset{(Q)}{ClCH_2COOH}$ $\underset{(R)}{O_2NCH_2COOH}$ $\underset{(S)}{NCCH_2COOH}$

(A) $R > P > S > Q$

(B) $P > Q > R > S$

(C) $R > S > Q > P$

(D) $R > S > P > Q$

4. Presence of which will make water unsuitable for drinking?

(A) $Mn = 0.5\ ppm$

(B) $Cu = 2\ ppm$

(C) $Zn = 0.05\ ppm$

(D) $Fe = 0.2\ ppm$

5. Which of the following is strongest acid

(A) $CH(CN)_3$

(B) CHI_3

(C) $CHCl_3$

(D) $CHBr_3$

6. Match the following drugs with correct functional group test

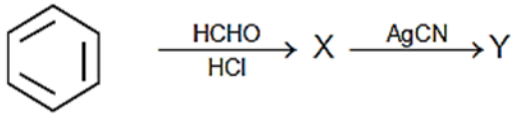
(A) Chloroxylenol	(P) Carbyl amine
(B) Penicillin	(Q) Baeyer's Reagent
(C) Sulpha pyridine	(R) $FeCl_3$ test
(D) Norethindrone	(S) Sodium hydrogen sulphate

(A) A →Q, B →R, C →P, D →S

(B) A →S, B →R, C →P, D →Q

(C) A →R, B →S, C →P, D →Q

(D) A →R, B →P, C →S, D →Q

7. 

Product X & Y will be

(A) $PhCH_2OH$ $\quad Ph-CH_2-CN$

(B) $PhCH_2Cl$ $\quad Ph-CH_2-CN$

(C) $Ph-CH_2-Cl$ $\quad Ph-CH_2-NC$

(D) $Ph-OH$ $\quad Ph-CH_2-CN$

8. $R-C\equiv N\frac{(1)\ \text{DIBAL}-H}{(2)\ H_2O}{}'X'$ X will be

(A) $R-CH=O$

(B) $R-NH_2$

(C) $RCOOH$

(D) $R-CH_2-NH_2$

9. Arrange the following amino acids in order of their pKa order Lysine, Asparatic acid, Arginine, Glycine.

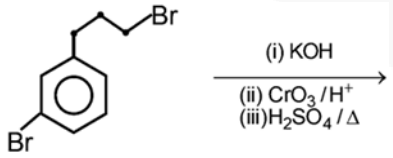
(A) $Lys > Arg > Gly > Asp$

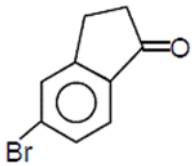
(B) $Gly > Asp > Arg > Lys$

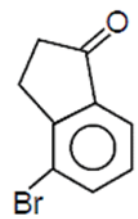
(C) $Arg > Lys > Asp > Gly$

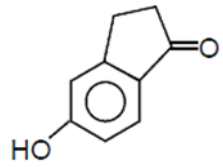
(D) $Arg > Lys > Gly > Asp$

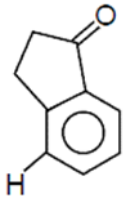
10. Write the product of given reaction.

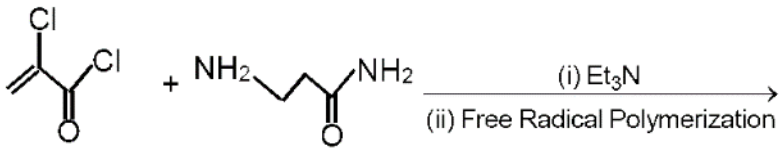


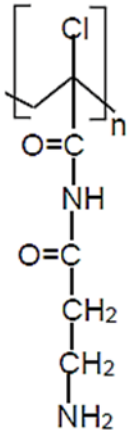
(A) 

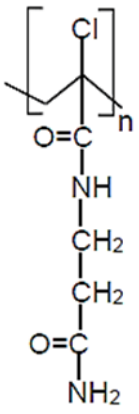
(B) 

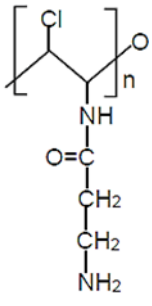
(C) 

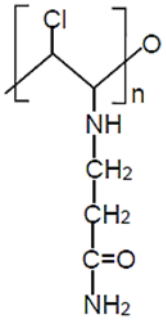
(D) 

11. 
Cl
Cl
O
+
NH2
NH2
O
(i) Et3N
(ii) Free Radical Polymerization

(A) 
Cl
n
O=C
NH
O=C
CH2
CH2
NH2

(B) 
Cl
n
O=C
NH
CH2
CH2
O=C
NH2

(C) 
Cl
O
n
NH
O=C
CH2
CH2
NH2

(D) 

12. The weight of Na^+ in the solution of Na_2SO_4 is $92g$. Find molality of Na^+ per kg of water?

(A) 2

(B) 6

(C) 8

(D) 4

13. Which of the following alkaline earth metal nitrate does not have water of crystallization?

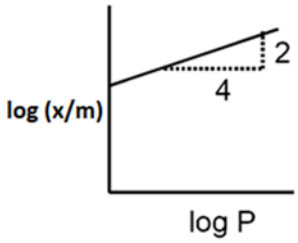
(A) $Ba(NO_3)_2$

(B) $Ca(NO_3)_2$

(C) $Mg(NO_3)_2$

(D) $Sr(NO_3)_2$

14. Which of the following option is correct for given curve?



(A) $\frac{x}{m} \propto (P)$

(B) $\frac{x}{m} \propto (P)^2$

(C) $\frac{x}{m} \propto (P)^{1/2}$

(D) $\frac{x}{m} \propto (P)^0$

15. Which of the following ore contains iron & copper

(A) Copper pyrite

(B) Azurite

(C) Malachite

(D) None of these

16. $20\,ml\,of\,0.1\,M\,H_2SO_4$ is added to $30\,ml\,of\,0.2\,M\,NH_4OH$ then calculate pH resultant solution.

Given that pk_b of $NH_4OH\,is\,4.7$

(A) 9.4

(B) 5.2

(C) 5

(D) 9

17. Considering MOT comment on the stability:

(A) Li_2^+ unstable Li_2^- unstable

(B) Li_2^+ stable Li_2^- stable

(C) Li_2^+ Stable Li_2^- unstable

(D) Li_2^+ unstable Li_2^- stable

18. which of the following is not correct about Henry's law

(A) value of K_H increases solubility of gas increases

(B) On increasing temperature value of K_H increase

(C) Value of K_H for two difference gases at same temperature is not same

(D) None

19. $2A + B \rightarrow$ product

$[A]$	$[B]$	$rate(M\,\min^{-1})$	
0.1	0.2	6.93×10^{-3}	(1)
0.1	0.2	6.93×10^{-3}	(2)
0.2	0.3	1.386×10^{-2}	(3)

Time when concentration of A becomes half

(A) 10

(B) 1

(C) 5

(D) 100

20. Which of the following property in a group decrease down the group and increase down the group respectively

(A) Electronegatively and electron gain enthalpy

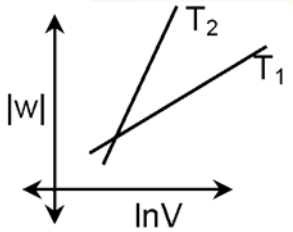
(B) atomic radius electronegatively

(C) electron gain enthalpy and electronegatively

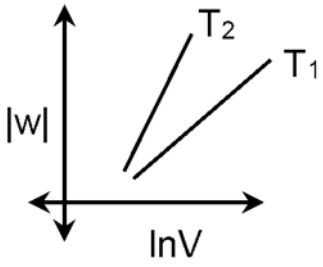
(D) Electronegatively and atomic radius

21. Reversible isothermal expansion of gas for two temperature T_1 & T_2 ($T_2 > T_1$). Graph versus $|w|$ *and* $|nV$

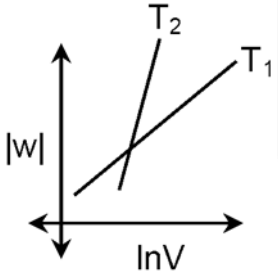
(A)



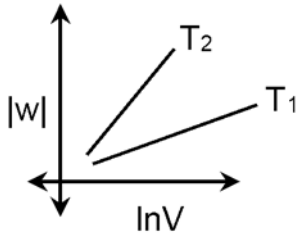
(B)



(C)



(D)



22. Consider the compound A $[Cr(H_2O)_6]Cl_3$ yellow B: $[Cr(NH_3)_6]Cl_3$: violet. Then which of the following is incorrect.

(A) The crystal field splitting parameter can be measured by wavelengths of yellow and violet colour for (A) and (B) respectively

(B) $(\Delta_0)_A < (\Delta_0)_B$

(C) Both are paramagnetic with three unpaired electrons each

(D) The crystal field splitting parameter can be measured by wavelengths of complementary colour for (A) and (B) respectively

23. Which of the following properties is/are true for a silicone polymer?

(1) Thermally resistant and have low dielectric constant

(2) Resistance towards oxidation and used in grease

(3) Biocompatible

(4) Hydrophobic in nature

(A) A & B

(B) ABC & D

(C) $B.C$ & D

(D) $A.B$ & C

24. $0.05F$ charge is passed through a lead stored battery. In the anodic reaction, what is the amount of $PbSO_4$ precipitated (molar mass of $PbSO_4$ is 303 g/mol)

(A) 15.15 g

(B) 7.6 g

(C) 30.3 g

(D) 60.6 g

25. Which of the following is piezoelectric material

(A) Silica

(B) Quartz

(C) Mica

(D) Beryl

26. Which of the following are isotope of hydrogen

(A) Deuterium, Protium

(B) Deuterium, Tritium

(C) Deuterium, Tritium, Protium

(D) Protium

27. In hydrogen emission spectrum transition takes place from $n = 8\, to\, n = n_t$. If we plot the graph of $\bar{V}\ vs \frac{1}{n_1^2}$. Which of the following statement is correct

(A) Slope $= -R_H$

(B) Slope $= R_H$

(C) Intercept $= R_H$

(D) Graph is non linear

28. Aluminum exist +3 state where as thallium in both $+1$ and $+3$ oxidation state. Reason for this is

(A) inert pair effect

(B) lanthanoid contraction

(C) Diagonal relationship

(D) None of these

29. Maximum spin magnetic moment for transition metal complex may be

(A) 5.92 BM

(B) 6.92 BM

(C) 4.89 BM

(D) 3.87 BM

30. Given a mixture with 0.5 mole of gas A and x moles of gas B. Total pressure is $200Pa$ at 1000 K temperature in a vessel of volume $10m^3$. Then, find x. (R universal gas constant)

(A) $\frac{4-R}{2R}$

(B) $\frac{4+R}{2R}$

(C) $\frac{2-R}{2R}$

(D) $\frac{2}{R}$