Question Number : 13 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The coefficient of volume expansion of an ideal gas at constant pressure:

Options :

1. increases with increase in temperature
2. decreases with increase in temperature
3. remains the same with increase in temperature
4. None of these

Question Number : 14 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If two identical soap bubbles coalesec to form a single big bubble, then the ratio of the surface energy of the big bubble to that of the small bubble is:

Options :

1. $(2)^{-2/3}$
2. $(2)^{-1/3}$
3. $(2)^{2/3}$
4. $(2)^{1/3}$

Question Number : 15 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Eight identical drops of water are falling down through air, each with a terminal velocity v. If they combine to form a big drop, then the terminal velocity of the big drop is:

Options :

1. v/4
2. 4v
3. v/8
4. 8v

Question Number : 16 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The pressure exerted by water on a fish at a depth h below the surface of lake water is 1.209×10^5 N/m^2. If atmospheric pressure is 1.013×10^5 N/m^2 and g = 9.8 m/s^2, then the value of h is:

Options :

1. 20 m
2. 15 m
3. 10 m
4. 2 m

Question Number : 17 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Water in a container cools from 80 ^{o}C to 70 ^{o}C in 9 minutes. If the temperature of the surroundings is 20 ^{o}C, then the time taken by water to cool from 70 ^{o}C to 60 ^{o}C is:

Options :

1. 9 minutes
2. 10 minutes
3. 11 minutes
4. 12.5 minutes

Question Number : 18 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two bodies A and B of equal masses are suspended from two separate massless springs of spring constants K_1 and K_2 respectively. If both bodies oscillate simple harmonically such that the magnitude of their maximum accelerations are equal, then the ratio of the amplitude of oscillation of body A to that of body B is:

Options :

1. $\sqrt{\frac{K_2}{K_1}}$
2. $\sqrt{\frac{K_1}{K_2}}$
3. $\frac{K_2}{K_1}$
4. $\left(\frac{K_2}{K_1}\right)^2$

Question Number : 19 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A wave travelling along a string is represented by
$y = 0.2 \text{ Sin } (20\ t - 2.0\ x)$
Where x is in metres and t in seconds. The speed of the wave is:

Options :

1. 20 m/s
2. 10 m/s
3. 5 m/s
4. 2 m/s

Question Number : 20 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A body is projected vertically upwards from the surface of the earth of radius R with a velocity equal to half of the escape velocity. The maximum height attained by the body is:

Options :

1. R/3
2. R/2
3. R/6
4. R /15

Question Number : 21 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is correct?

Options :

1. Woolen clothes keep our body warm because they produce heat due to convection
2. Bernoulli's theorem is a consequence of the law of conservation of mass
3. Latent heat of fusion of a substance is less than the latent heat of vaporization of the substance
4. Dimensional formula of coefficient of viscosity is $[M^{-1} L^{-1} T]$

Question Number : 22 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In a given process on an ideal gas, volume of the gas ramians constant and $dQ < 0$. Then for the gas

Options :

1. temperature will increase

2. temperature will decrease

3. temperature will remain the same

4. pressure will remain constant

Question Number : 23 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A police van and a car are approaching each other from opposite directions on a straight highway. The police van is travelling with a speed of 72 km/h and its siren is emitting sound at a frequency of 640 Hz. The frequency of the sound heard by the driver of the car travelling with a speed of 54 km/h is: (speed of sound = 340 m/s)

Options :

1. 577.8 Hz

2. 631.1 Hz

3. 708.9 Hz

4. 710 Hz

Question Number : 24 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A test charge of + 2 μC is placed at a point P where the electric field due to other charges has a magnitude of 3 x 10^6 N/C and directed to the right. If the test charge is replaced with a charge of -2 μC, then the electric field at point P:

Options :

1. decreases in magnitude and changes direction

2. increases in magnitude and changes direction

3. remains the same

4. has the same magnitude but changes direction

Question Number : 25 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A spherical balloon contains a positively charged particle at its cente, If the balloon is inflated to double its volume keeping the charged particle at its centre, then:

Options :

1. the electric potential at the surface of the balloon remains the same

2. the magnitude of the electric field at the surface of the balloon remains the same

3. the electric flux through the balloon increases

4. . the electric flux through the balloon remains the same

Question Number : 26 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A proton is released from rest in a uniform electric field of intensity E directed along positive x-axis. If the proton undergoes a displacement d in the direction of the electric field, then the electrical potential energy of the proton:

Options :

1. increases

2. decreases

3. remains the same

4. None of these

Question Number : 27 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

An electric circuit provides a current of 15 A at an operating voltage of 120V. The number of bulbs each of 60W which can be operated with this voltage source are:

Options :

1. 20

2. 25

3. 30

4. 35

Question Number : 28 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two charged particles A and B are projected with the same velocity at right angles to a magnetic field of intensity B. Both the particles A and B describe circular paths of radii r_1 and r_2 respectively . The ratio of the specific charge of the particle A to the specific charge of the particle B is:

Options :

1. (r_1/r_2)

2. (r_2/r_1)

3. $(r_1/r_2)^2$

4. $(r_2/r_2)^2$

Question Number : 29 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If an electron revolves around the nucleus of an atom in an orbit of radius 0.53 ^{o}A at a frequency of 5 x 10^{15} revolution/second, then the magnetic induction at the centre of the orbit is:

Options :

1. 7.48 T

2. 8.89 T

3. 9.00 T

4. 9.48 T

Question Number : 30 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The magnetic flux through a closed coil is varying with time according to the relation:

$\boldsymbol{\Phi} = 5 + 2t^2$

The magnitude of the induced e.m.f in the coil

Options :

1. increases with time

2. decreases with time

3. first increases and then decreases

4. is independent of time

Question Number : 31 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If a resistor of 12 ohm, an inductor of inductance 0.1 H and a capacitor of reactance 19.4 ohm are joined in series and connected across a 220V, 50 Hz a.c. Supply, then the phase angle between the current and voltage is:

Options :

1. $\pi/6$

2. $\pi/4$

3. $\pi/3$

4. $\pi/2$

Question Number : 32 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In a plane electro magnetic wave, the electric field of amplitude 36 V/m oscillates sinusoidally at a frequency of 2.0 x 10^{10} Hz in vaccum. The amplitude of the oscillating magnetic field is:

Options :

1. 10.8×10^{-7} T

2. 1.6×10^{-7} T

3. 1.06×10^{-7} T

4. 1.2×10^{-7} T

Question Number : 33 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In the active state of a transistor:

Options :

1. both emitter base junction and collector base junction are forward biased

2. both emitter base junction and collector base junction are reverse biased

3. emitter base junction is forward biased and collector base junction is reverse biased

4. emitter base junction is reverse biased and collector base junction is forward biased

Question Number : 34 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A message signal given by

$E_m = 10 \sin 2x10^4 \pi t$

is used to modulate a carrier wave given by $E_c = 20 \sin 2 \times 10^6 \pi t$

The frequencies of the modulated signal are

Options :

1. 1.98 MHz, 2 MHz, 2.02 MHz

2. 0.99 MHz, 1 MHz, 1.01 MHz

3. 0.49 MHz, 1 MHz, 1.01 MHz

4. 0.89 MHz, 1 MHz, 0.91 MHz

Question Number : 35 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

During β -decay

Options :

1. an electron which is already present in the nuclear is ejected

2. an atomic electron is ejected

3. a part of the binding energy of the nucleus is converted into an electron

4. a neutron already present in the nucleus decays into proton giving an electron

Question Number : 36 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A convex lens of focal length ' f ' is in contact with a concave lens of focal lenght 25 cm. If the power of the combination of these two lenses is -1.5 D, then the focal lenght ' f 'of the convex lens is:

Options :

1. 15 cm

2. 20 cm

3. 40 cm

4. 42.5 cm

Question Number : 37 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The refracting angle of a prism 'A 'and refractive index of the material of the prism is cosec (A/2). The angle of minimum deviation is:

Options :

1. $(180^{o} - 2A)$

2. $(180^{o} - A)$

3. $(180^{o} + 2A)$

4. $(180^{o} + A)$

Question Number : 38 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In young's double slit experiment, using monochromatic light of wavelength /, the intensity of light at a point on the screen where path difference is / is I units. What is the intensity of light at a point on the screen where the path difference is $\lambda/4$

Options :

1. $\lambda / 8$

2. $\lambda / 4$

3. $\lambda /2$

4. λ

Question Number : 39 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If de-Broglie wavelenght of an elctron having kinetic energy 100 eV is /, then the de-Broglie wavelength of electron having kinetic energy 400 eV is:

Options :

1. 4λ

2. 2λ

3. λ

4. $\frac{\lambda}{2}$

Question Number : 40 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

When light of frequency 3 is incident on a metal surface having threshold frequency υ is the maximum kinetic energy of the emitted photo electon from the metal surface is K. If the light of frequency 5 is incident on the same metal surface, then the maximum kinetic energy of the emitted photo electron is:

Options :

1. 2 k

2. 3 k

3. 5 k

4. 8 k

Question Number : 41 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The frequency of the series limit of Lyman series of hydrogen atom in terms of Rydberg constant R and speed of light in vacuum (c) is :

Options :

1. 2 Rc

2. 2/Rc

3. Rc

4. Rc/2

Question Number : 42 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The half life of a radioactive substance is 10 days. This implies that

Options :

1. the substance is completely disintegrates in 20 days

2. the substance is completely disintegrates in 50 days

3. 1/64 part of the mass of the substance disintegrates at the end of 30 days

4. 7/8 part of the mass of the substance disintegrates in 30 days

Question Number : 43 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The image formed by the objective of compound microscope is:

Options :

1. virtual, erect and magnified

2. virtual, inverted and magnified

3. real, inverted and magnified

4. real, erect and magnified

Question Number : 44 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

An aperture of size 'd 'is illuminated by a parallel beam of light of wavelength /. The distance from the aperture at which ray optics has a good approximation is:

Options :

1. ^{2} / d

2. ^{2} /

3. ^{2}

4. /d

Question Number : 45 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two cells of e.m.f. 2V, 3V and internal resistances 1ohm and 2 ohm respectively are connected in parallel. The equivalent e.m.f of the parallel combination of the cells is:

Options :

1. 1/3 V

2. 4/3 V

3. 7/3 V

4. 8/3 V

Question Number : 46 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A power transmission line feeds input power at 2200V to a step down transformer with its primary windings having turns 3000. The number of truns in the secondary windings in order to get output power at 220V are:

Options :

1. 300

2. 400

3. 600

4. 800

Question Number : 47 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A mettalic wire of lenght L has a magnetic moment M. If the wire is bent into a semi-circular arc, then the value of new magnetic moment is:

Options :

1. M / π

2. M / 2π

3. 2M / π

4. 2π M

Question Number : 48 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If a body released from the top of a tower of height h takes t seconds to reach the ground, then the height of the body from the ground after (t/3) seconds is:

Options :

1. h / 9

2. 3h / 8

3. h / 8

4. 8h / 9

Question Number : 49 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If carnot's engine operating between the source temperature 227 ^{o}C and sink temperature 27 ^{o}C takes up 1 KJ of heat from the source in one cycle, then the work done by the engine is:

Options :

1. 800 J

2. 600 J

3. 400 J

4. 200 J

Question Number : 50 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two rods of different materials having young's modulii Y_1 and Y_2 and coefficients of thermal expansion α_1 and α_2 are fixed between two rigid supports. The rods are heated to the same temperature. If there is no bending of the rods, the thermal stresses developed in these rods are equal provided:

Options :

1. $\frac{Y_1}{Y_2} = \sqrt{\frac{\alpha_2}{\alpha_1}}$

2. $\frac{Y_1}{Y_2} = \frac{\alpha_1}{\alpha_2}$

3. $\frac{Y_1}{Y_2} = \sqrt{\frac{\alpha_1}{\alpha_2}}$

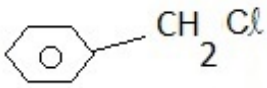
4. $\frac{Y_1}{Y_2} = \frac{\alpha_2}{\alpha_1}$

Chemistry

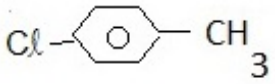
Section Marks:	200
Display Number Panel:	Yes

Group All Questions: No

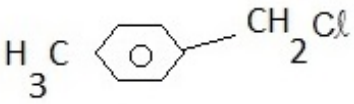
Question Number : 51 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Given compounds are 

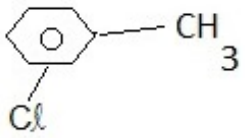
(a)



(b)



(c)



(d)

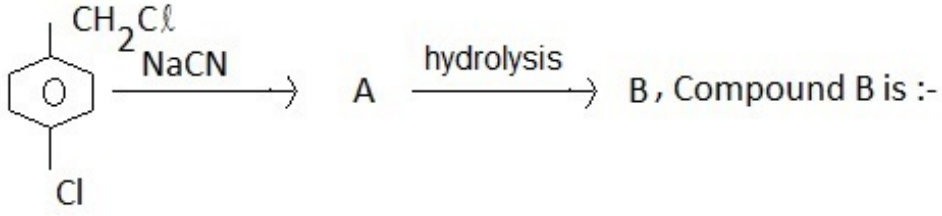
Which of the above compounds on treatment with Mg/Eiher solvent followed by treatment with H_2O will give toluene

Options :

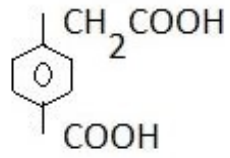
1. b, d
2. b, c, d
3. a, b, d
4. a, b, c

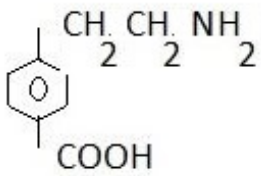
Question Number : 52 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

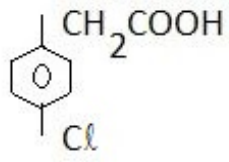
Compound B is:

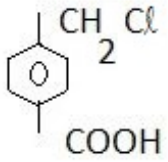


Options :

1. 

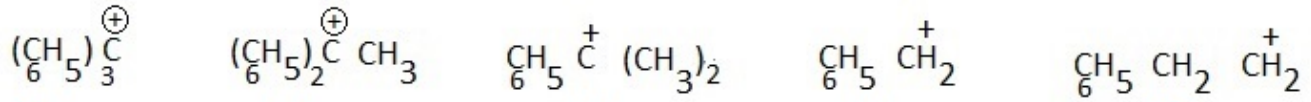
2. 

3. 

4. 

Question Number : 53 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The order of stability of above carbocations



is

Options :

1. a>b>c>d>e
2. a>b>d>c>e
3. a>b>c>e>d
4. d>e>a>b>c

Question Number : 54 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

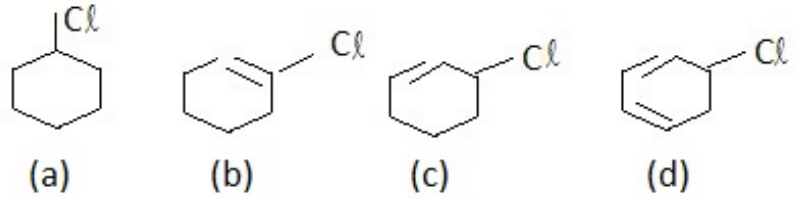
When p-xylene is treated with O_3 followed by treatment with Zn/H_2O. The product obtained are

Options :

1. Glyoxal
2. 2 Methyl glyoxal
3. Dimethyl glyoxal
4. Glyoxal + methyl glyoxal

Question Number : 55 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Order of dehydro halogenation of the following compounds



Options :

1. d>c>a>b

2. d>b>c>a

3. c>d>a>b

4. a>b>c>d

Question Number : 56 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The relative reactivity of HCHO, CH_3 CHO, $(CH3)_3$C CHO, CH_3 CO CH_3,C_6H_5 CO CH_3 in nucleophilic addition reaction is

Options :

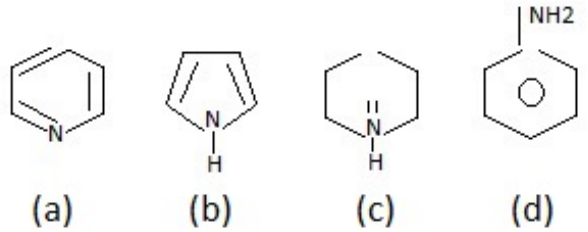
1. HCHO>CH_3 CHO> $(CH_3)_3$C CHO >CH_3 CO CH_3> C_6 H_5 CO CH_3

2. CH_3 CO C_6H_5 >CH_3 CO CH_3>$(CH_3)_3$ C CHO> CH_3 CHO> HCHO

3. CH_3 CHO >$(CH_3)_3$ C CHO > HCHO> CH_3 CO C_6H_5 >CH_3 CO CH_3

4. HCHO> CH_3CHO > CH_3 CO CH_3> $(CH_3)_3$ C CHO> CH_3 CO $_6H_5$

Question Number : 57 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The basic character of 

(a) (b) (c) (d)

is in the order

Options :

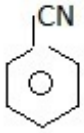
1. c>a>d>b

2. a>c>d>b

3. c>a>b>d

4. b>c>a>d

Question Number : 58 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In the reaction 

$\xrightarrow[(ii)\ NaNO_2/Hc\ell\ (0\text{-}5^{\circ}C)]{(i)\ Sn/Hc\ell}$ [A] $\xrightarrow{Pc\ell5}$ [B] ,

B is

Options :

1.