FIITJEE

ALL INDIA TEST SERIES

FULL TEST – VII

JEE (Main)-2019

TEST DATE: 24-03-2019

Time Allotted: 3 Hours **Maximum Marks: 360**

General Instructions:

- The test consists of total 90 questions.
- Each subject (PCM) has 30 questions.
- This question paper contains **Three Parts.**
- **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
- Each part has only one section: **Section-A**.

  Section-A (01 – 30, 31 – 60, 61 – 90) *contains 90 multiple choice questions which have* ***only one correct answer****. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

Physics

PART – I

SECTION – A
(One Options Correct Type)

This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

1. At t = 0, an object is projected from ground with an initial velocity of 50 m/s directed at angle 53° above the horizontal. After some time it explodes in air into two parts with the mass ratio 1 : 2. Take the point of projection as origin and horizontal and vertical directions as x and y axes respectively. The motion of object is confined to the xy plane. At t = 5 sec, the coordinates of the lighter part is (100m, 50m). The coordinates of the heavier part at this moment (i.e. t = 5 sec) will be (Given g = 10 m/s^2, $\cos 53^\circ = \frac{3}{5}$)

   (A) (125 m, 175 m)

   (B) $(\frac{175}{2}\text{m}, 175\text{ m})$

   (C) (175m, 175 m)

   (D) $(175\text{ m}, \frac{175}{2}\text{m})$

2. A particle of mass m is thrown vertically upwards in air with initial velocity v_0. During the motion air exerts a resistive force of magnitude F = kv^2 opposite to its motion where v is the instantaneous velocity of the particle and k is a constant. The maximum height attained by the particle from the point of the projection is

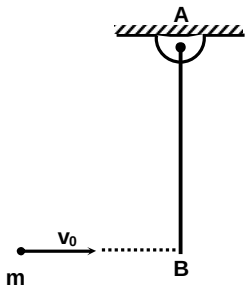
   (A) $\frac{m}{k}\ell n\left(\frac{g+\frac{kv_0^2}{m}}{g}\right)$

   (B) $\frac{m}{2k}\ell n\left(\frac{g+\frac{kv_0^2}{m}}{g}\right)$

   (C) $\frac{2m}{k}\ell n\left(\frac{g+\frac{kv_0^2}{m}}{g}\right)$

   (D) $\frac{m}{k}\ell n\left(\frac{g+\frac{kv_0^2}{m}}{2g}\right)$

3. A thin uniform rod of length ℓ and mass m suspended vertically is free to rotate about a smooth horizontal axis which passes through its end A. A point mass m moving horizontally with velocity v_0 hits the lower end B of the rod and sticks to it. After collision the rod just reaches the horizontal position. Which of the following statements is **WRONG**?



(A) The value of v_0 is $\sqrt{4g\ell}$

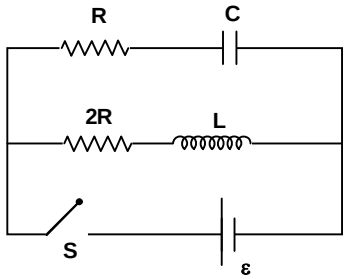
(B) The angular acceleration of the rod when it reaches the horizontal position is $\frac{9g}{8\ell}$

(C) The magnitude of reaction force by the hinge on the rod in horizontal position is $\frac{5mg}{8\ell}$

(D) The magnitude of acceleration of centre of mass of the system (rod + point mass) when the rod is in horizontal position is $\frac{27g}{32}$.

4. In the circuit shown in the figure switch S is closed at t = 0. Then which of the following statements is **WRONG**.

(Given : $R = \sqrt{\frac{L}{2C}}$)



(A) Initial current through the battery is ε/R.

(B) After a long time current through battery is $\frac{\varepsilon}{2R}$.

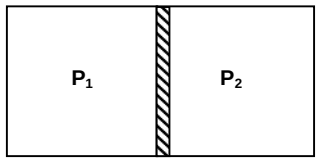
(C) The current in the battery is $\frac{5}{8}$ times its initial value at t = RCℓn2.

(D) The currents in the inductor and the capacitors are equal at t = RCℓn3.

5. A pipe P open at one end but closed at the other end is filled with hydrogen gas at temperature 27°C. An another pipe Q is open at both ends and having length equal to twice the length of pipe P is filled with Helium gas at temperature 77°C. The pipe P is vibrating in its first overtone and pipe Q is vibrating in its second overtone. The ratio of their frequencies of vibration is

(A) 5/3
(B) 6/5
(C) 3/10
(D) 1/4

6. Figure shows an adiabatic cylindrical container of volume $2V_0$ divided in two parts by a frictionless movable adiabatic piston. Initially the piston is in middle and the two parts of container contain an ideal monatomic gas at pressures P_1 and P_2 respectively. The piston is now released and allowed to move slowly until mechanical equilibrium is attained. The gas pressure now is



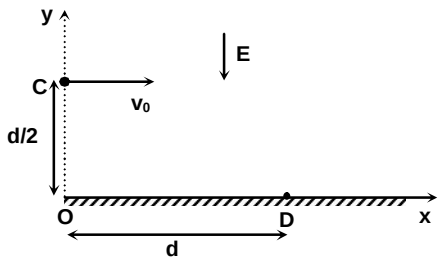
(A) $\frac{P_1+P_2}{2}$

(B) $\frac{\left(P_1^{3/5}+P_2^{3/5}\right)}{2}$

(C) $\frac{\left(P_1^{3/5}+P_2^{3/5}\right)^{5/3}}{2^{5/3}}$

(D) $\frac{\left(P_1^{3/2}+P_2^{3/2}\right)^{2/3}}{2^{2/3}}$

7. A particle of mass m and charge q moving in gravity free space with velocity v_0 parallel to x-axis enters a region of uniform electric field $-E\hat{j}$ at point C. At the moment particle collides elastically with a smooth surface at D the electric field E is switched off and a magnetic field $\vec{B}=-B_0\hat{k}$ is switched on. If the particle hit the surface at point O after rebounding from point D, then B_0 is equal to



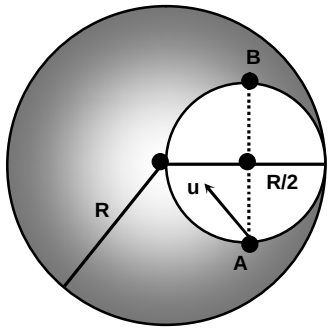
(A) $\sqrt{\frac{2mE}{qd}}$

(B) $2\sqrt{\frac{mE}{qd}}$

(C) $\sqrt{\frac{mE}{2qd}}$

(D) $\frac{1}{2}\sqrt{\frac{mE}{qd}}$

8. An infinite long cylinder of radius R has a cylindrical cavity of radius R/2 just touching its surface. The region inside the cylinder is filled with uniform charge density ρ except in the cavity. A charge particle of charge q and mass m is thrown from point A in the cavity. Find the minimum velocity u required at A for it to reach point B. AB is perpendicular to the diameter of the cavity passing through the axis of the cylinder.



(A) $\sqrt{\frac{q\rho R^2}{4\varepsilon_0 m}}$

(B) $\sqrt{\frac{q\rho R^2}{2\varepsilon_0 m}}$

(C) $\sqrt{\frac{2q\rho R^2}{\varepsilon_0 m}}$

(D) $\sqrt{\frac{4q\rho R^2}{\varepsilon_0 m}}$

9. A car moving toward a wall with a speed $\frac{v}{10}$ and wind is blowing in the direction from wall towards the car with same speed $\frac{v}{10}$, where v is the speed of sound with respect to air. The driver of the car sounds a whistle with a frequency f. The frequency of the echo as heard by the driver of the car is equal to

(A) $\frac{9f}{8}$

(B) $\frac{27f}{22}$

(C) $\frac{12f}{11}$

(D) $\frac{32f}{33}$

10. The mean time between successive collision between the molecules of an ideal gas is τ. If the gas is isobarically heated to twice its initial volume. As a result the mean time between successive collision between the molecule becomes.

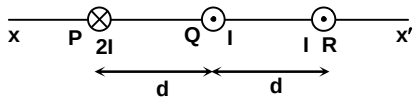
(A) $\sqrt{2}\tau$

(B) $\frac{\tau}{\sqrt{2}}$

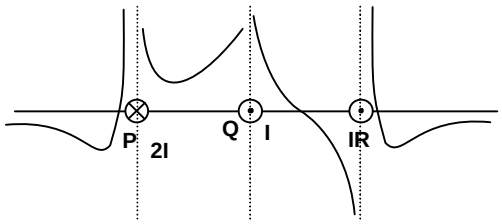
(C) $\frac{\tau}{2}$

(D) 2τ

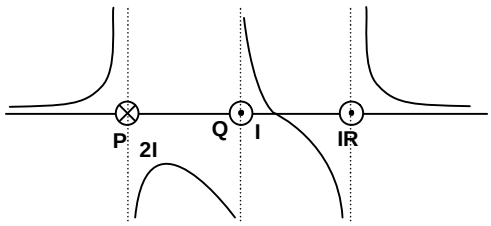
11. Three long parallel current carrying wires are placed with their lengths normal to the plane of paper. The magnitude and direction of current are shown in the figure. The currents in wire P is 2I into the plane of paper. The current in each of wires Q and R is I and directed out of the plane of the paper. The variation of magnetic field along the line xx′ given by



(A)



(B)



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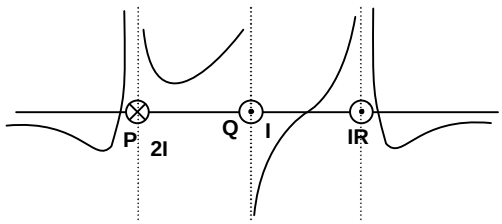
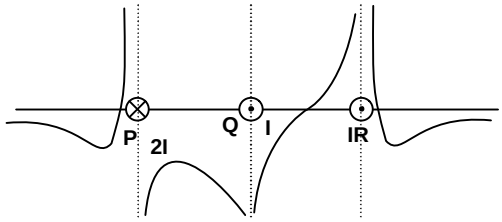


(D)



12. The distance moved by the screw of a screw gauge is 2 mm in four rotations and there are 50 divisions on its circular scale. Before starting the measurement, it is found that when the two jaws of the screw gauge are brought in contact 48^{th} division of circular scale coincides with main scale line with zero of the main scale is barely visible. When a plate is placed between the jaws, main scale reads 1 mm and 6^{th} division of the circular scale coincides with the main scale line. Thickness of the plate is
(A) 1.06 mm
(B) 1.04 mm
(C) 1.08 mm
(D) 1.12 mm

13. Which of the following equations is dimensionally correct? (k = Boltzmann constant, T = temperature, C = Capacitance, V = Potential difference, L = Inductance, h = Planck's constant, I = current, R = Resistance, ε_0 = permittivity of free space and ℓ = length)

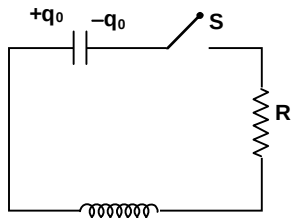
(A) $\frac{k}{V} = \frac{C}{T}$

(B) $\frac{L}{h} = I\,RC$

(C) $\frac{I^2}{h^2} = RC^2$

(D) $\frac{\varepsilon_0 E^2}{I^2} = \frac{L}{\ell^3}$

14. In the given circuit initially the switch S is open and the capacitor has charge q_0. The switch is closed at time t = 0. Find the time when the amplitude of charge on capacitor will be $\frac{q_0}{2}$. (Assume that resistance R is quite small and damped oscillations are setup in the circuit)



(A) $\frac{L}{R}\ell n2$

(B) $\frac{2L}{R}\ell n2$

(C) $RC\ell n2$

(D) $2RC\ell n2$

15. A point source of heat of power P is placed at the centre of a spherical shell of mean radius R. The material of shell has thermal conductivity k. If the temperature difference between the outer and inner shell is not to exceed T, then thickness of the shell should not be more than

(A) $\frac{2\pi R^2 kT}{P}$

(B) $\frac{4\pi R^2 kT}{P}$

(C) $\frac{\pi R^2 kT}{P}$

(D) $\frac{\pi R^2 kT}{4P}$

16. A stationary nucleus disintegrates suddenly in two nuclei X and Y. The ratio of the kinetic energy of the two nuclei X and Y after the disintegration is 1 : 2, the ratio of the radii of the nuclei X and Y will be

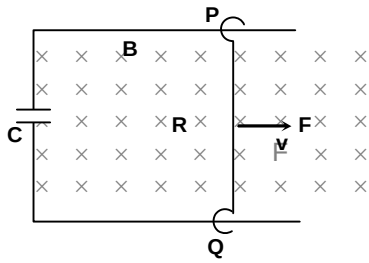
(A) 2

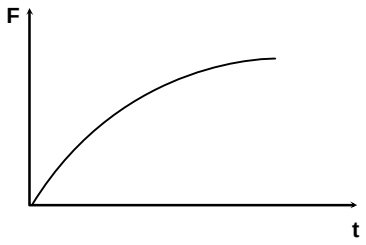
(B) $2^{2/3}$

(C) $\frac{1}{2^{1/3}}$

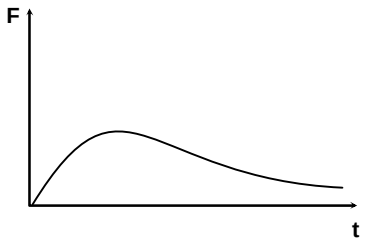
(D) $2^{1/3}$

17. In the given circuit two conducting parallel wires are connected by a connector PQ of resistance R. The end of the wires are connected by a capacitor of capacitance C. There is a uniform magnetic field B in the entire region directed into the plane of the paper. The connector is given an initial velocity v with the capacitor initially uncharged, simultaneously a variable force F(t) is applied to maintain the velocity v constant. The magnitude of force F varies with time as

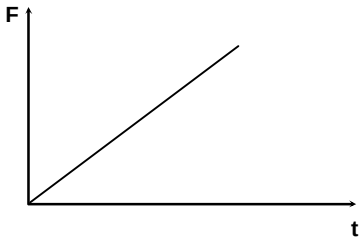


(A)


(B)


(C)


(D)



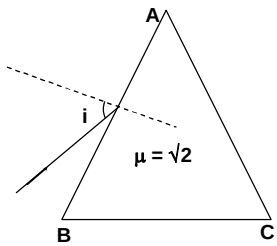
18. The peak value of magnetic field at a distance 6 m from a bulb is 2×10^{-8} T. Assuming that 10% of power consumed by the bulb is converted into light energy, the power consumed by the bulb is
(A) 432 W
(B) 216 W
(C) 1080 W
(D) 108 W

19. Two Polaroids are placed in the path of unpolarised beam of intensity I_0 such that no light is emitted from the second polaroid. If a third polaroid whose transmission axis makes an angle θ with transmission axis of the first polaroid is placed between these polaroid then the intensity of light emerging from last polaroid will be
(A) $\left(\frac{I_0}{8}\right)\sin^2 2\theta$
(B) $\left(\frac{I_0}{4}\right)\sin^2 \theta$
(C) $\left(\frac{I_0}{24}\right)\cos^2 \theta$
(D) $I_0 \cos^4 \theta$

20. A magnet is suspended in such a way that it executes simple harmonic motion in horizontal plane. It makes 20 oscillations per minute at a place where dip angle is 30° and 15 oscillations per minute at place where dip angle is 60°. The ratio of earth's magnetic field at two places is
(A) $2\sqrt{2} : 3$
(B) 4 : 9
(C) $16 : 9\sqrt{3}$
(D) $3\sqrt{3} : 8$

21. A point object is placed at a distance of 25 cm from a convex lens of focal length 24 cm. If a glass slab of thickness t and refractive index 1.5 is inserted between the lens and the object the final image is formed at infinity. The thickness t is
(A) 1 cm
(B) 3 cm
(C) 2 cm
(D) 4 cm

22. A ray of light is incident on surface AB of an equilateral prism of refractive index $\sqrt{2}$. What should be the maximum angle of incidence i so that the ray could not emerge in air from surface AC
(A) 30°
(B) 45°
(C) $\sin^{-1}(0.366)$
(D) $\sin^{-1}(0.677)$



23. A stationary hydrogen atom of mass M emits a photon corresponding to the first line of Lyman series. If R is the Rydberg's constant, the speed of recoil of the atom after the emission of the photon is

(A) $\frac{3Rh}{4M}$

(B) $\frac{Rh}{4M}$

(C) $\frac{Rh}{2M}$

(D) $\frac{Rh}{M}$

24. The kinetic energy of most energetic electrons emitted from a metallic surface is doubled when the wavelength of the incident radiation is changed from 400 nm to 310 nm. The work function of the metal is (given hc = 1240 eV-nm)

(A) 0.9 eV
(B) 3.1 eV
(C) 1.7 eV
(D) 2.2 eV

25. A sphere and a cube of same material, same volume and heated to the same temperature are allowed to cool in the same surroundings. The ratio of their initial rate of cooling is

(A) $(6\pi)^{1/3}$

(B) $\left(\frac{\pi}{6}\right)^{1/3}$

(C) $\left(\frac{\pi}{3}\right)^{1/3}$

(D) $\left(\frac{2\pi}{3}\right)^{1/3}$

26. n identical liquid drop each of radius r combined to form a bigger drop. Assuming that energy released in the process is converted into kinetic energy of the bigger drop, the speed of the bigger drop is (given surface tension of the liquid = T and density of the liquid = ρ)

(A) $\sqrt{\frac{3T}{r\rho}\left(1-\frac{1}{n^{1/3}}\right)}$

(B) $\sqrt{\frac{6T}{r\rho}\left(1-\frac{1}{n^{1/3}}\right)}$

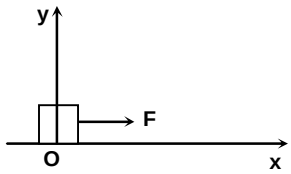
(C) $\sqrt{\frac{6T}{r\rho}\left(1-\frac{1}{n^{2/3}}\right)}$

(D) $\sqrt{\frac{3T}{r\rho}\left(1-\frac{1}{n^{2/3}}\right)}$

27. A satellite is revolving in geostationary orbit of radius r around the Earth. If the angular velocity of rotation of the Earth becomes half of its present value, the new radius of geostationary orbit for satellite will be
(A) $4^{1/3}r$
(B) $2^{1/3}r$
(C) $4^{2/3}r$
(D) r

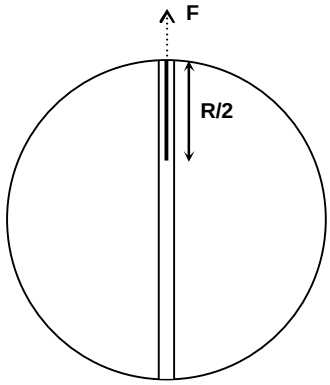
28. A message signal of frequency 60 kHz and peak voltage 8V is used modulate a carrier of frequency 2 MHz and peak voltage of 20 V. Then
(A) The frequencies of the side bands are 2050 Hz and 1940 Hz
(B) The frequencies of the side bands are 2040 Hz and 1940 Hz
(C) The modulation index is 0.8
(D) The modulation index is 0.4

29. A block of mass m is placed on a rough horizontal surface at x = 0. The coefficient of friction between the block and the surface varies as $\mu = kx$ where k is a constant. A constant horizontal force F is applied on the block. Then the maximum velocity of block will be



(A) $\sqrt{\frac{F^2}{km^2g}}$
(B) $\sqrt{\frac{F^2}{2km^2g}}$
(C) $\sqrt{\frac{2F^2}{km^2g}}$
(D) $\sqrt{\frac{F^2}{4km^2g}}$

30. Suppose a frictionless tunnel is made inside the earth along a diameter. A string of mass m and length R/2 is suspended in the tunnel with one end of the string at the surface of the earth. A force F is applied to pull the string slowly to the surface to the earth. Find the work done by the force F to pull the string completely on the surface of the earth. (Given acceleration due to gravity on the surface of the earth = g, radius of the earth = R)



(A) $\frac{mgR}{2}$
(B) $\frac{3mgR}{4}$
(C) $\frac{5mgR}{12}$
(D) $\frac{5mgR}{24}$

Chemistry

PART – II

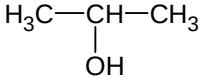
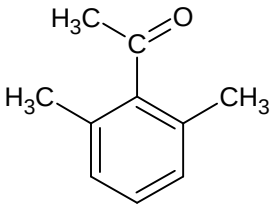
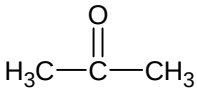
SECTION – A
(One Options Correct Type)

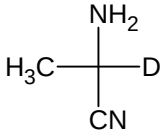
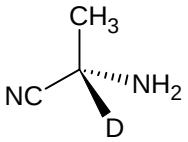
This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

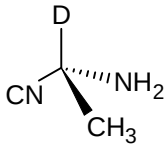
31. Which of the following orders is correct with respect to the given property?
    (A) $SiF_4 > SiCl_4$ Dipole moment order
    (B) $MgCO_3 > SrCO_3 > BaCO_3$
    P_{CO_2} order when kept at a fixed temperature in a closed container.
    (C) $XeF_2 > XeF_4$ Dipole moment order
    (D) LiBr > LiCl > LiF Lattice energy order

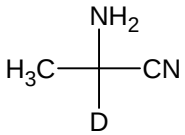
32. pH of a saturated solution of $Ba(OH)_2$ is 12. Hence, K_{sp} of $Ba(OH)_2$
    (A) 5×10^{-7}
    (B) 5×10^{-4}
    (C) 10^{-6}
    (D) 4×10^{-5}

33. Which of the following option is correct?
    (A) Borazine is a polar molecule
    (B) All B – H bond lengths in diborane are equal
    (C) B_2O_3 reacts as a basic oxide with P_2O_5
    (D) The order of Lewis acidity
    $BF_3 > BCl_3 > BBr_3$

34. Which of the following molecules does not undergo Iodoform reaction
    (A) 
    (B) $CH_3 - CH_2 - OH$
    (C) 
    (D) 

35. Which of the following configuration is identical with given configuration?
    
    (A) 

(B) 

(C) 

(D) None of these

36. The migration of colloidal particles under the influence of the electric field is called.
(A) electro osmosis
(B) endosmosis
(C) electrophoresis
(D) electrolysis

37. In the following reaction sequences, compounds B and C are respectively:

$$Na_2S_2O_3 \xrightarrow{dil.H_2SO_4} Na_2SO_4 + S\downarrow + B(gas)$$

$$B + Ba(OH)_2 \longrightarrow C\downarrow (\text{white ppt}) + H_2O$$

$$\downarrow B$$

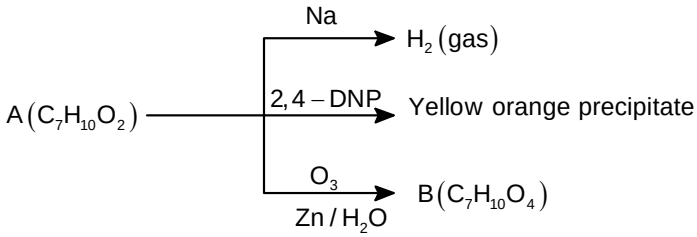
Clear solution

(A) H_2S and $BaSO_3$
(B) SO_2 and $BaSO_3$
(C) H_2S and $Ba(HSO_3)_2$
(D) CO_2 and $Ba(HSO_3)_2$

38. What is the increasing order of the energies of electrons which are identified by the quantum numbers n & ℓ.
I. n = 4, ℓ =1
II. n= 4, ℓ = 0
III. n = 3, ℓ = 2
IV. n = 3, ℓ = 1
(A) III < IV < II < I
(B) IV < II < III < I
(C) II < IV < I < III
(D) I < III < II < IV

39. Chlorine can be liquefied easily as compared to ethane because:
(A) a and b for Cl_2 > a and b for C_2H_6
(B) a and b for Cl_2 < a and b for C_2H_6
(C) a for Cl_2 > a for C_2H_6 and b for Cl_2 > b for C_2H_6
(D) a for Cl_2 > a for C_2H_6 and b for Cl_2 < b for C_2H_6

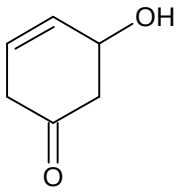
40. The compound A gives the following reactions

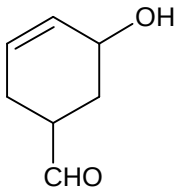


The structure of A can be:

(A) $CH_2 = CH - (CH_2)_2 - \underset{\underset{O}{\|}}{C} - CH_2OH$

(B) $H - \underset{\underset{O}{\|}}{C} - (CH_2)_6 - CH = CH - COOH$

(C) 

(D) 

41. A metal M can give the following observable change in a sequence of reactions.

$M \xrightarrow[HNO_3]{\text{diluted}} \text{colourless solution} \xrightarrow[NaOH]{\text{aq.}} \text{white ppt.} \xrightarrow[NaOH]{\text{excess}} \text{colourless solution} \xrightarrow{H_2S} \text{white ppt.}$

The metal M is:

(A) Mg
(B) Pb
(C) Zn
(D) Sn

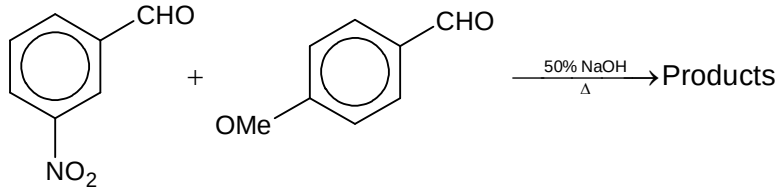
42. For the given concentration cell $M|M^{2+}$ (saturated solution of MX_2)$||M^{2+}$ (0.001 molar) | M. (MX_2 is a sparingly soluble salt) the EMF is 0.059 volt at the temperature 298 K.

What is the solubility product of MX_2 at 298 K? (Consider $\frac{2.303R \times 298}{F} = 0.059\ V$)

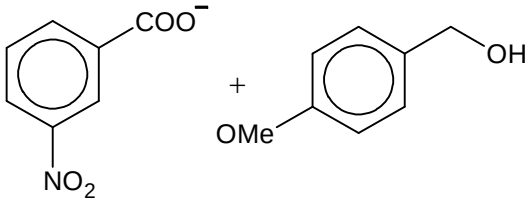
(A) 10^{-15}
(B) 4×10^{-15}
(C) 10^{-12}
(D) 4×10^{-12}

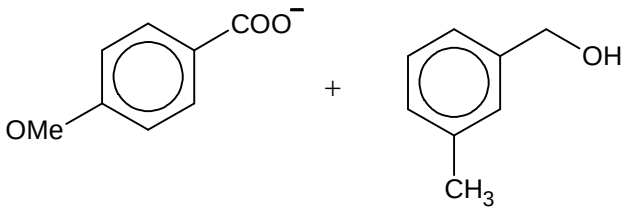
43. 0.518 gm sample of lime was dissolved in HCl and then calcium is precipitated as CaC_2O_4. After filtration and washing, the precipitate required 40 ml of 0.25 N $KMnO_4$ solution in acidic medium for complete reaction. Find out the percentage of CaO in lime sample

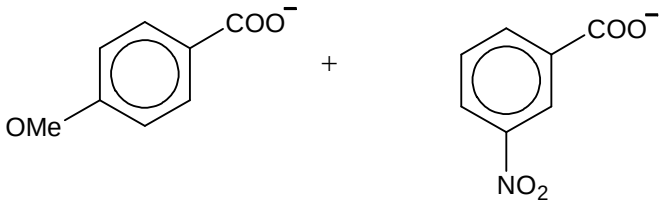
(A) 54%
(B) 27%
(C) 42%
(D) 84%

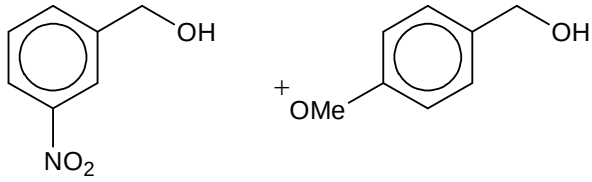
44. 

Identify the products obtained:

(A) 

(B) 

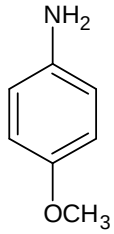
(C) 

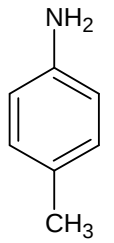
(D) 

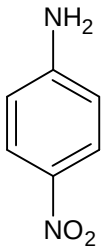
45. The V – C bond distances in $V(CO)_6$ and $\left[V(CO)_6\right]^-$ are respectively (in pm)

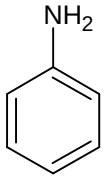
(A) 200, 200
(B) 193, 200
(C) 200, 193
(D) 193, 193

46. Which of the following compounds responds in the carbyl amine test in the fastest rate?

(A) 

(B) 

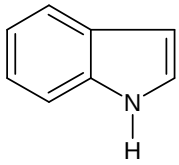
(C) 

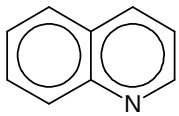
(D) 

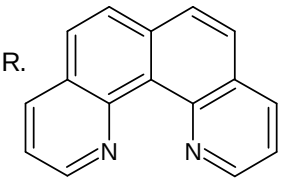
47. A doctor by mistake administrated a $Ba(NO_3)_2$ solution to a patient for radiography investigation. Which of the following should be given as best to prevent the absorption of soluble barium?
(A) NaCl
(B) Na_2SO_4
(C) $NaClO_4$
(D) NH_4Cl

48. Ba^{2+}, CN^-, And Co^{2+} form an ionic compound. If the complex is supposed to 75% ionized in water with van't Hoff factor =4, what is the coordination number of Co^{2+} in the complex?
(A) 6
(B) 5
(C) 4
(D) 8

49. Which of the following is the correct order of basic nature?

P. 

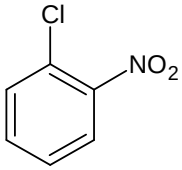
Q. 

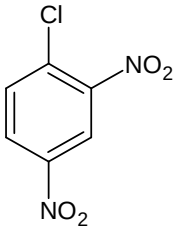
R. 

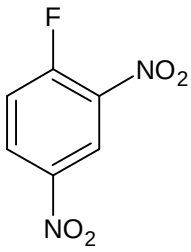
(A) Q > R > P
(B) R > Q > P
(C) R > P > Q
(D) Q > P > R

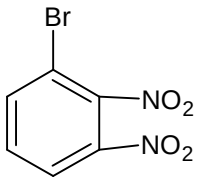
50. Which of the following two are isostructural?
(A) XeF_4, PCl_5^+
(B) ICl_2^-, CO_2
(C) CO_3^{2-} & SO_3^{2-}
(D) PCl_5, BrF_5

51. Which of the following is most readily hydrolysed by aqueous alkali?

(A) 

(B) 

(C) 

(D) 

52. At moderate pressure, the compressibility factor for a gas is given by

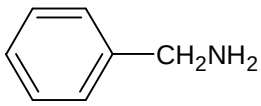
$Z = 1 + 0.34P - \frac{160P}{T}$ (P in bar & Tin Kelvin)

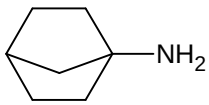
What is the Boyle temperature of gas?

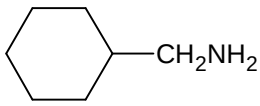
(A) 298 K
(B) 340 K
(C) 470 K
(D) 680 K

53. Which of the following amines can not be synthesized by Gabriel's phthalimide method?

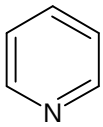
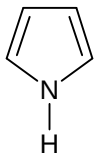
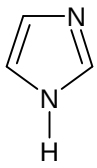
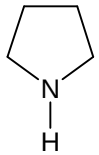
(A) $CH_3CH_2NH_2$

(B) 

(C) 

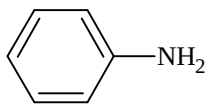
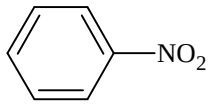
(D) 

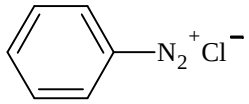
54. Cu^{2+} on reaction with $K_4[Fe(CN)_6]$ gives reddish brown precipitate. The formula of reddish brown precipitate is
(A) $Cu_4[Fe(CN)_6]$
(B) $Cu_2[Fe(CN)_6]$
(C) $Cu_3[Fe(CN)_6]$
(D) $Cu_3[Fe(CN)_6]_2$

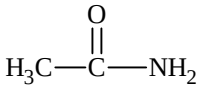
55. Which of the following compounds is most basic?
(A) 
(B) 
(C) 
(D) 

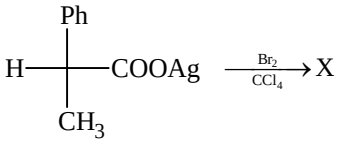
56. Which of the following statement is INCORRECT?
(A) A process may take place in single step and can be isothermal simultaneously.
(B) The internal energy of real gas does not change during isothermal process.
(C) All the spontaneous process are irreversible.
(D) Adsorption is an exothermic process.

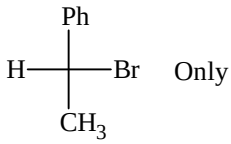
57. For a reaction
$A \longrightarrow P$
Half life measured for two different values of initial concentrations 5×10^{-3} M and 25×10^{-4} M are 1 and 8 hrs respectively. If initial concentration is adjusted to 1.25×10^{-3} M, what is the half-life?
(A) 16 hr
(B) 32 hr
(C) 64 hr
(D) 256 hr

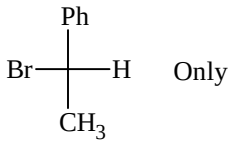
58. Which of the following compounds does not perform Lassaigne Test?
(A) 
(B) 

(C) 

(D) 

59. 

(A)  Only

(B)  Only

(C) Racemic mixture

(D) Diastereomeric mixture

60. Which of the sulphides can not be oxidized by concentrated HNO_3?

(A) CuS

(B) CdS

(C) Bi_2S_3

(D) HgS

Mathematics

PART – III

SECTION – A
(One Options Correct Type)

This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

61. Let P and Q are two points which lies on the line $3x + y = 41$ where $x \geq 0$, $y \geq 0$, if P, Q have integral coordinates, then find number of triangles ΔOPQ such that area of ΔOPQ is integral where O is origin
(A) 41
(B) 42
(C) 43
(D) 44

62. There are two circles C_1 and C_2 whose radii are r_1 and r_2 respectively. If distance between there centre is $3r_1 - r_2$ and length of direct common tangent is twice of the length of transverse common tangent. Then $r_1 : r_2$ is
(A) 5 : 4
(B) 6 : 5
(C) 7 : 6
(D) 8 : 7

63. Let $x^2 = 3ax + 2ay + 3$ is a family of parabola where a is parameter. Then the locus of the vertex of the parabola is
(A) $3x^2 + 4xy + 9 = 0$
(B) $4x^2 + 3xy + 9 = 0$
(C) $4x^2 + 9xy + 3 = 0$
(D) none of these

64. A tangent at any point P on the ellipse $\frac{x^2}{16} + \frac{y^2}{8} = 1$ intersect the major axis at point R and M, M′ are foot of perpendiculars drawn from the focus S and S′ of the ellipse if RS : RS′ = 2 : 3. Then SM is equal to
(A) $\frac{11}{\sqrt{3}}$
(B) $\frac{7}{\sqrt{3}}$
(C) $\frac{5}{\sqrt{3}}$
(D) $\frac{4}{\sqrt{3}}$

65. Tangent at any point P on the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ intersects the asymptotes at points A and B, if C is the centre of the hyperbola, then area of ΔABC is
(A) 4 sq. units
(B) 6 sq. units
(C) 8 sq. units
(D) none of these

66. The value of $\sum_{r=1}^{50}\frac{1^3+3^3+5^3+.....+(2r-1)^3}{1+3+5+.....+(2r-1)}$

(A) 85800
(B) 85700
(C) 85600
(D) 85500

67. If all the equations $x^2 + (2a + 3b)x + 60 = 0$, $x^2 + ax + 10 = 0$ and $x^2 + bx + 8 = 0$ where $a, b \in R$, have a common root, then value of $|a - b|$ is
(A) 0
(B) 1
(C) 2
(D) none of these

68. The complex number z satisfying $z + |z| = 1 + 7i$, then the value of $\sqrt{|z+\bar{z}|^2+|z-\bar{z}|^2}$ is
(A) 30
(B) 40
(C) 50
(D) none of these

69. The sum of value of r for which ${}^{18}C_{r-2} + 2\cdot{}^{18}C_{r-1} + {}^{18}C_r \geq {}^{20}C_{13}$
(A) 40
(B) 50
(C) 60
(D) 70

70. There are 7A & 6B and they are to be arranged linearly, then number of palindromes are
(A) 30
(B) 40
(C) 50
(D) none of these

71. Probability of n heads in 2n tosses of a fair coin be given by
(A) $\prod_{r=1}^{n}\left(\frac{2r-1}{2r}\right)$
(B) $\prod_{r=1}^{n}\left(\frac{n+r}{2r}\right)$
(C) $\sum_{r=0}^{n}\frac{{}^nC_r}{2^{2n}}$
(D) $\frac{\sum_{r=0}^{n}\left({}^nC_r\right)^2}{\left(\sum_{r=0}^{n}{}^nC_r\right)^2}$

72. Let p and q be two statements, then $\sim(\sim p \wedge q) \wedge (p \vee q)$ is logically equivalent to
(A) q
(B) $p \wedge q$
(C) p
(D) $p \vee \sim q$

73. The variance of first 100 odd natural numbers is
(A) 2222
(B) 3333
(C) 4444
(D) 5555

74. If $A_n = \sin n\theta \cdot \sec^n \theta$, $B_n = \cos n\theta \cdot \sec^n \theta$, then $\frac{B_n - B_{n-1}}{A_{n-1}} + \frac{1}{n} \cdot \frac{A_n}{B_n}$ is equal to
(A) 0
(B) $\tan\theta$
(C) $-\tan\theta + \frac{\tan(n\theta)}{n}$
(D) $\tan\theta + \frac{\tan(n\theta)}{n}$

75. The value of x in $\left(0, \frac{\pi}{2}\right)$ satisfying equation $\frac{\sqrt{5}-1}{\sin x} + \frac{\sqrt{10+2\sqrt{5}}}{\cos x} = 8$ is
(A) $\frac{\pi}{8}$
(B) $\frac{\pi}{9}$
(C) $\frac{\pi}{10}$
(D) none of these

76. Suppose $3\sin^{-1}(\log_2 x) + \cos^{-1}(\log_2 y) = \frac{\pi}{2}$ and $\sin^{-1}(\log_2 x) + 2\cos^{-1}(\log_2 y) = \frac{11\pi}{6}$, then the value of $\frac{1}{x^2} + \frac{1}{y^2}$ is
(A) 2
(B) 4
(C) 6
(D) 8

77. If ℓ is the length of median from the vertex A to the side BC of ΔABC, then
(A) $4\ell^2 = 2b^2 + 2c^2 - a^2$
(B) $4\ell^2 = 2b^2 + c^2 + 2bc\cos A$
(C) $4\ell^2 = 2a^2 + 4bc\cos A$
(D) $4\ell^2 - (2s-a)^2 = bc\sin^2\frac{A}{2}$

78. Each side of an equilateral triangle subtends an angle of 60º at the top a tower h meter high located at the centre of the triangle. If a is the length of each side of the triangle, then
(A) $3a^2 = 2h^2$
(B) $2a^2 = 3h^2$
(C) $a^2 = 3h^2$
(D) $3a^2 = h^2$

79. If the system of equations $a = \frac{x}{y-z}$, $b = \frac{y}{z-x}$ and $c = \frac{z}{x-y}$ is consistent, then ab + bc + ca is equal to

(A) 0
(B) 1
(C) 2
(D) none of these

80. Let $A=\begin{bmatrix} x^2 & 6 & 9 \\ 3 & y^2 & 9 \\ 4 & 5 & z^2 \end{bmatrix}$, $B=\begin{bmatrix} 2x & 3 & 5 \\ 2 & 2y & 6 \\ 1 & 4 & 2z-3 \end{bmatrix}$ if trace A = trace B, then x + y + z is equal to

(A) 1
(B) 2
(C) 3
(D) none of these

81. If the plane ax – by + cz = 0 contains the line $\frac{x-a}{a}=\frac{y-2d}{b}=\frac{z-c}{c}$, $(b \neq 0)$ then $\frac{b}{d}$ is equal to

(A) 1
(B) 2
(C) 0
(D) –3

82. Given $|\vec{a}|=|\vec{b}|=1$ and $|\vec{a}+\vec{b}|=\sqrt{3}$, if $\vec{c}$ be a vector such that $\vec{c}-\vec{a}-2\vec{b}=3(\vec{a}\times\vec{b})$, then $\vec{c}\cdot\vec{b}$ is equal to

(A) $-\frac{1}{2}$
(B) $\frac{1}{2}$
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$

83. Let n(A) = 4 and n(B) = 6, then number of one-one functions from A to B is
(A) 120
(B) 360
(C) 24
(D) none of these

84. Let $g(x)=\begin{cases} \frac{ax^2+bx+c(\cot x)^n}{4+(\cot x)^n}, & x\in\left(0,\frac{\pi}{4}\right) \\ 1, & \text{at } x=\frac{\pi}{4} \\ \frac{\sin x+\cos x+(\tan x)^n}{1+c(\tan x)^n}, & x\in\left(\frac{\pi}{4},\frac{\pi}{2}\right) \end{cases}$, where a, b, c are real constants and $f(x)=\lim_{n\to\infty} g(x)$. If $\lim_{x\to\frac{\pi}{4}} f(x)$ exists, then c may be equal to

(A) 2
(B) $\frac{1}{2}$
(C) 3
(D) –1

85. If $y = e^{3x}$, then $\left(\frac{d^2y}{dx^2}\right)\left(\frac{d^2x}{dy^2}\right)$ is

(A) 1
(B) e^{-3x}
(C) $3e^{-3x}$
(D) $-3e^{-3x}$

86. The minimum distance of the curve $y^2 = 2x^3 + 9 - 3x^2$ from point Q(1, 0) is
(A) 2
(B) $2\sqrt{2}$
(C) $4\sqrt{2}$
(D) 8

87. If $\int x^3 \sin 3x\left(3x\cos 3x + 2\sin 3x\right)dx = \frac{x^a\left(\sin 3x\right)^b}{d} + c$, then a + b + d is
(A) 4
(B) 6
(C) 8
(D) none of these

88. If $\int_0^x f\left(t\right)dt = x + \int_x^1 t^2 f\left(t\right)dt$, then the value of the integral $\int_{-1}^{1} f\left(x\right)dx$ is equal to
(A) 0
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{2}$
(D) π

89. The area enclosed by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, $\frac{\left(x-7\right)^2}{16} + \frac{y^2}{4} = 1$ and y = 2 is
(A) $\frac{28-\pi}{2}$ sq. units
(B) $\frac{28-3\pi}{2}$ sq. units
(C) $\frac{28-5\pi}{2}$ sq. units
(D) $\frac{28-7\pi}{2}$ sq. units

90. If y(t) satisfies the differential equation $y'(t) + 2y(t) = 2e^{-2t}$, y(0) = 2, then y(1) equals
(A) $\frac{3}{e}$
(B) $\frac{3}{e^2}$
(C) $\frac{4}{e}$
(D) $\frac{4}{e^2}$