JEE Main 2024 Question Paper Jan 29 Shift 1 (B.E./B.Tech)

JEE Main Physics Questions

Ques 1. The voltage applied across the resistance R is 200+5 and current in resistance is 20+0.2 then find % error in resistance.

A. 3.5 %
B. 5 %
C. 7 %
D. 3 %

Ans. A

Ques 2. A body of mass 100 kg traveled 10 m before coming to rest. If μ = 0.4, work done against friction is - (motion is happening in a horizontal surface, tak g = 10 m/s²)

A. 4500J
B. 50000J
C. 4200J
D. 4000J

Ans. D

Ques 3. If an object is having the same weight at the same distance above and below the surface of earth. Find its distance from the surface of earth.

A. R/2

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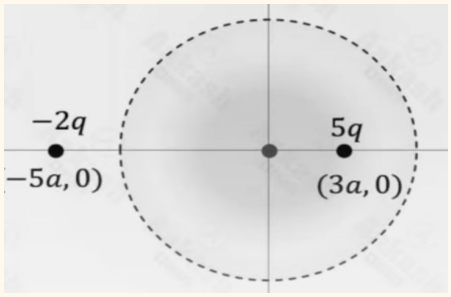
B. (√5-1)R/2
C. (√3-1)R/2
D. (√5-1)R

Ans. B

Ques 4. A solid sphere of radius 4a units is placed with its centre at origin. Two charges -2q at (-5a, 0) and 5q at (3a, 0) is placed. If the flux through the sphere is xq/ϵ_0 , find x



Ans. 5

Ques 5. Consider the two statements (Assume density of water to be constant):
Statement 1: A capillary tube is first dipped in hot water and then dipped in cold water. The rise is higher in hot water.
Statement 2: Capillary tube is first dipped in cold water and then in hot water. The rise is higher in cold water.

A. Statement 1 is true and Statement 2 is false
B. Statement 1 is false and Statement 2 is true
C. Both Statement are true
D. Both Statement are false

Ans. B

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Ques 6. A stationary hydrogen atom deexcites from first excited state to ground state. Find recoil speed of hydrogen atom up to nearest integer value. (mass of hydrogen atom = 1.8 x 10-27 kg)

Ans. 3

Ques 7. If a particle starting from rest having constant acceleration covers distance S1 in first (P -1) seconds & S2 in first P seconds, then determine time for which displacement is S1 + S2 :

A. $\sqrt{2P^2 + 1 - 2P}$
B. $\sqrt{2P^2 + 1 + 2P}$
C. $\sqrt{(P - 1)^2 - P}$
D. $2P$

Ans. A

Ques 8. If the ratio of centripetal acceleration of two particles moving on the same circular path is 3: 4. Find the ratio of their speed.

A. $2 : \sqrt{3}$
B. $\sqrt{3} : 2$
C. $\sqrt{3} : 1$
D. $\sqrt{2} : 1$

Ans. B

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Ques 9. De-Broglie wavelength of a proton and an electron is same. The ratio of kinetic energy of electron to that of proton is

A. 1
B. 1835
C. 1/1867
D. 933.5

Ans. B

Ques 10. A capacitor having capacitance of 100uF is charged with a potential difference of 12 V is connected to an inductor of inductance 10 mH. Find the maximum current through the inductor.

A. 2 A
B. 1.6 A
C. 2.4 A
D. 1.2 A

Ans. D

Ques 11. A gas undergoes a cyclic process ABCA as shown. Find the work done by the gas from A→B→C.

A. 1800J
B. 1200J
C. 3600J
D. 600J

Ans. B

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Ques 12. If electric current passing through a conductor varies with time as I = 10 + A ßt, where Io = 20 A, B = 3A/S, then find charge flow through the conductor in first 10 sec is

A. 400 C
B. 500 C
C. 200 C
D. 350 C

Ans. D

Ques 13. A square loop of resistance 16 Ω is connected with battery of 9 V and internal resistance of 1 Ω. In steady state. Find energy stored in capacitor of capacity C = 4 μF as shown. (at steady state current divides symmetrically)

A. 51.84 μJ
B. 12.96 μJ
C. 25.92 μJ
D. 103.68 μJ

Ans. C

Ques 14. If a biconvex lens of material of refractive index 1.5 has focal length 20 cm in air, then its focal length when it is submerged in a medium of refractive index 1.6 is

A. -160 cm
B. 160 cm
C. 1.6 cm
D. -16 cm

Ans. A

Ques 15. In a container, 1 g of hydrogen and 1 g of oxygen are taken. Find the ratio of hydrogen pressure to oxygen pressure.

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Ans. 16

Ques 16. Potential energy function corresponding to conservative force is given as $U(x, y, z) = 3x^2/2 + 5y + 6z$ then the force at x = 6 is pN. The value of p upto 2 its nearest integral value is

Ans. 20

Ques 17. Consider a series of steps as shown. A ball is thrown from 0. Find the minimum speed to directly jump to 5th step.

A. $5(\sqrt{2}+1)$ m/s
B. $5(\sqrt{2})$ m/s
C. $5(\sqrt{(\sqrt{2}+1)})$ m/s
D. $6(\sqrt{3}+1)$ m/s

Ans. C

Ques 18. An electron is moving with the speed of 1 m/s at a distance of 1 m, from a large sheet of charge with density σ C/m^2. Find the maximum value of σ such that electron hits the sheet after 1 sec. (mass of electron = 9×10^{-31} kg, Permittivity of free space=$9*10^{12} C^2/Nm^2$

A. $4.05*10^{-22}$ C/m^2
B. $8.10*10^{-22}$ C/m^2
C. $4.05*10^{-24}$ C/m^2
D. $2.02*10^{-20}$ C/m^2

Ans. A

Ques 19. In a convex mirror having radius of curvature 30 cm the height of image is half the object height. What will be the object distance (in cm)?

Ans. -15 cm

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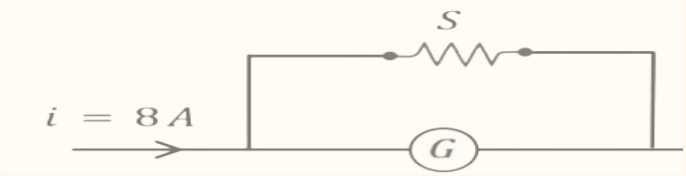
Ques 20. In the voltage regulator circuit shown below, the reverse breakdown voltage of Zener diode is 3 V. Find the current through Zener diode.

A. 7 mA
B. 1.5 mA
C. 5.5 mA
D. 10 mA

Ans. C

Ques 21.Consider the circuit shown. Galvanometer resistance is 10 Ω and current through galvanometer is 3 mA. Find the resistance of shunt.



A. 10^{-3} Ω
B. $7.5 * 10^{-3}$ Ω
C. $6.75 * 10^{-3}$ Ω
D. $3.75 * 10^{-3}$ Ω

Ans. D

Ques 22. A particle is executing simple harmonic motion along the x - axis, with amplitude A, about the origin. Then the ratio of Kinetic energy and total energy at x = A/3 is

A. 8/9
B. ⅞
C. 1/9
D. 1/8

Ans. A

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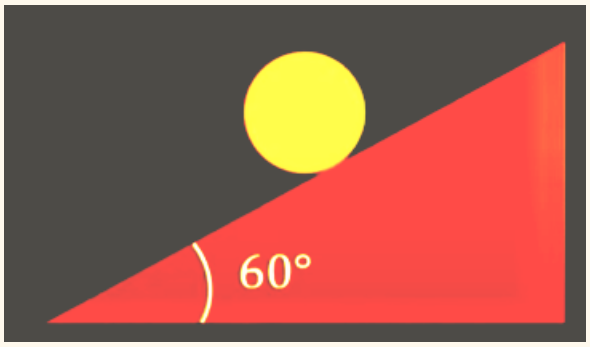
Ques 23. Voltage and resistance for a resistor are measured as V = 200±5V & R = 20 + 0.2 Ω. Find the percentage error in the current I = V /R

Ans. 3.5

Ques 24. A solid cylinder is placed gently over an incline plane of inclination 60°. The acceleration of cylinder when it start rolling without slipping is g/√x where μ is the coefficient of friction. [take g = 10m / (s ^ 2)]



Ans. 3.00

JEE Main Chemistry Questions

Ques 1. Which of the following pairs will be formed by the decomposition of KM_nO_4?

A. MnO_4- , MnO_2
B. K_2MnO_4 , MnO_2
C. $KMnO_4$, MnO_2
D. MnO_2, H_2O

Ans. B

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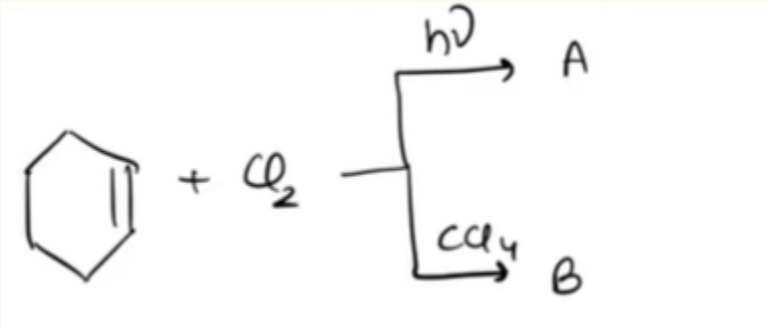
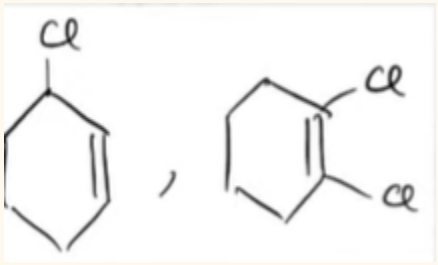
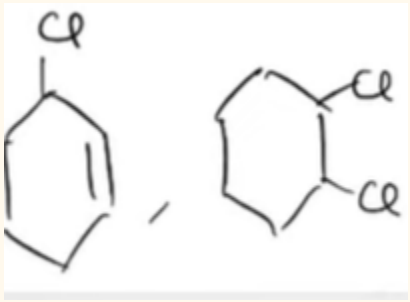
Ques 2. Calculate the Molarity of a Solution having density = 1.25 g/ml. %(w/w) of Solute is 36% and Molecular weight of Solute is 36 g/mol

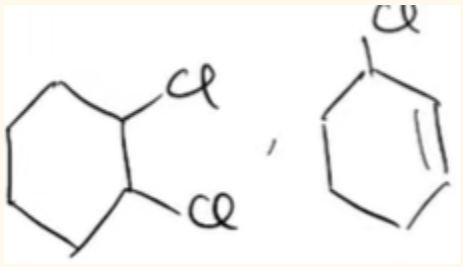
Ans. 12.5 M

Ques 3. In the following reactions, find the product A and B



A. 

B. 

C. 

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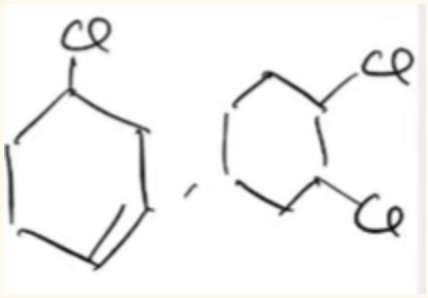
D. 

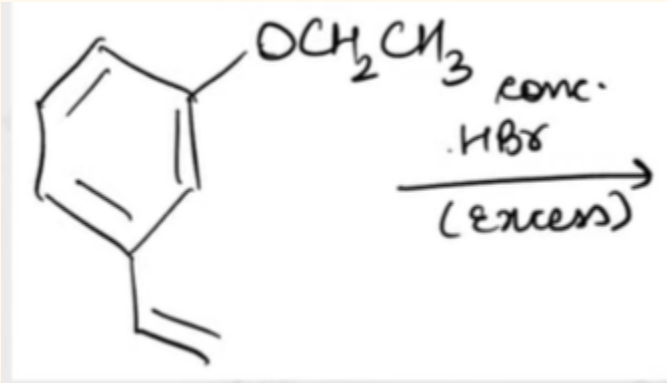
Ans. B

Ques 4. Appearance of Red color on treatment with Na fusion extract of an organic compound with $FeSo_4$ in presence of Conc. H_2SO_4 indicate element

A. N
B. Br
C. S
D. N & S

Ans. D

Ques 5. The major product formed in the following reaction is-



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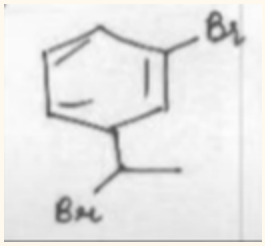
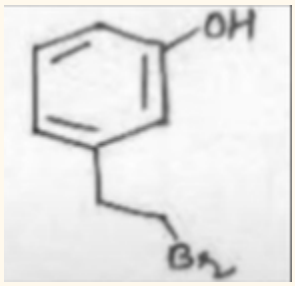
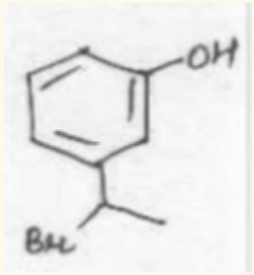
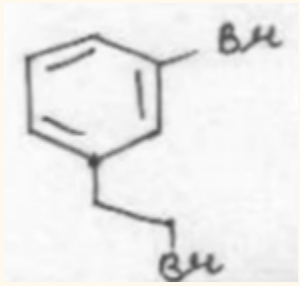
A. 

B. 

C. 

D. 

Ans. C

Ques 6. Energy difference between actual structure and its most stable resonating structure having least energy is called

A. Electromeric effect
B. Resonance Energy
C. Inductive effect
D. Hyperconjugation

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Ans. B

Ques 7. Interaction b/w π bond & Lone pair of e-s on adjacent atoms

- **A. Resonance**
- **B. Hyperconjugation**
- **C. Inducting Effect**
- **D. Electronic & effect**

Ans. A

Ques 8. Which of The following coordination compounds has bridging carbonyl ligand

- **A. $[Mn_2(CO)_{10}]$**
- **B. $[Co_2(CO)_8]$**
- **C. $[Cr(CO)_6]$**
- **D. $[Fe(CO)_5]$**

Ans. B

Ques 9. Alkaline KMnO4 Oxidised iodide to a particular product (A). Determine the oxidation state of iodine in the compound (A)

- A. +2
- B. -3
- C. +5
- D. -7

Ans. C

Ques 10. Which of the following statement is incorrect?

- **A. $\triangle G = 0$ for reversible reaction**
- **B. $\triangle G < 0$ for spontaneous process**

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C. $\triangle G > 0$ for spontaneous process
D. $\triangle G < 0$ for non-spontaneous process

Ans. C

Ques 11. Given $K_{net} = (K_1.K_2)/K_3$
When Ea_1= 40 kJ/mol, Ea_2= 50 kJ/mol and Ea_3= 60 kJ/mol
Calculate the value of $(Ea)_{net}$ in kJ/mol.

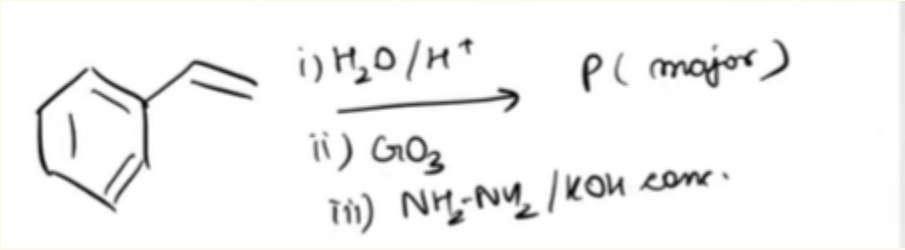
Ans. 30 kJ/mol

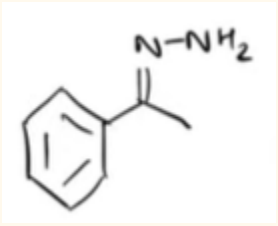
Ques 12. What is the effect that occurs between lone pair and pi bond?

A. Inductive effect
B. Electromeric effect
C. Resonance effect
D. Hyperconjugation

Ans. C

Ques 13. Find product P of the following reaction-



A. 

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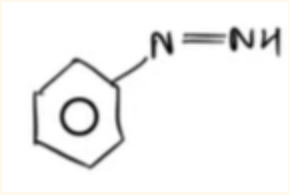
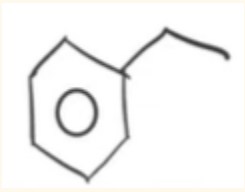
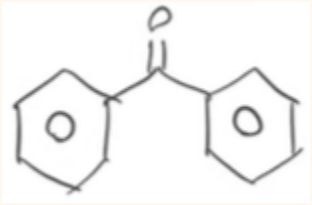
B. 

C. 

D. 

Ans. C

Ques 14. Statement 1: Electronegativity of group 14 elements decreases from Si to Pb
Statement 2: Group 14 has metals, metalloids and non-metals

A. Both statements 1 and 2 are correct
B. Both statements 1 and 2 are incorrect
C. Statement 1 is correct and statement 2 is incorrect
D. Statement 1 is incorrect and statement 2 is correct

Ans. D

Ques 15. Hydrolysis of protein gives which type of amino acids

A. α- Amino acids
B. β- Amino acids
C. γ- Amino acids
D. δ- Amino acids

Ans. A

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Ques 16. How many of the following compounds have one lone pair in the central atom?
ClF3, XeO3, BrF5, XeF4, O3, NH3

Ans. B

Ques 17. A container contains 1 g H_2 gas and 1g O2 gas. What is the ratio of partial pressure of H_2 and O_2 (P_{H2}/ P_{O2})

A. 16:1
B. 8:1
C. 4:1
D. 1:1

Ans. A

Ques 18. How many of the following species have Bond order =1 and are Paramagnetic as well.
He_2^{2+}, O^{2-}_2, Ne_2^{2+}, F_2, B_2, H_2, O_2^{2+}

Ans. 1

Ques 19. Match the following:

Column 1	Column 2
(A) Flourspar	(p) $Al_2O_3.2H_2O$
(B) Cryolite	(q) CaF_2
(C) Bauxite	(r) $MgCO_3.CaCO_3$
(D) Dolomite	(s) $Na_3[AlF_6]$

A. (A) - s; (B)-q; (C) - r; (D) - p
B. (A)-q; (B)-s; (C) - p; (D) - r
C. (A) - p; (B) - q; (C) - s; (D) - r

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D. (A)-q; (B) - s; (C) - r; (D) - p

Ans. B

JEE Main Mathematics Questions

Ques 1. Let a die rolled till 2 is obtained. The probability that 2 obtained on even numbered toss is equal to:

A. 5/11
B. 5/6
C. 1/11
D. 6/11

Ans. A

Ques 2. Evaluate: $\lim_{x \to \frac{\pi}{2}^-} \frac{\int_{x^3}^{\left(\frac{\pi}{2}\right)^3} \cos t^{\frac{1}{3}}\, dt}{\left(x - \frac{\pi}{2}\right)^2}$

A. $3\pi^2/4$
B. $3\pi/4$
C. $3\pi^2/8$
D. $3\pi/8$

Ans. C

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Ques 3. $\frac{C_1^{11}}{2}+\frac{C_2^{11}}{3}+\cdots+\frac{C_9^{11}}{10}=\frac{m}{n}$. Then m+n is

Ans. 2041

Ques 4. Rank of the word 'GTWENTY' in dictionary ia ……

Ans. 553

Ques 5. If $|2A|^3$ =21 and A= $\begin{bmatrix}1&0&0\\0&\alpha&\beta\\0&\beta&\alpha\end{bmatrix}$ **, then a is (if α, β € I)**

- **A. 5**
- **B. 3**
- **C. 9**
- **D. 17**

Ans. A

Ques 6. In a 64 terms GP if sum of total terms is seven times sum of odd terms, then common ratio is:

- **A. 3**
- **B. 4**
- **C. 5**
- **D. 6**

Ans. D

Ques 7. If $\frac{dy}{dx}-\left(\frac{\sin 2x}{1+\cos^2 x}\right)y=\frac{\sin x}{1+\cos^2 x}$ **and y(0) =0 then y(π/2) is ……..**

- **A. -1**
- **B. 1**

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C. 0
D. 2

Ans. B

Ques 8. If 4 cosθ + 5 sinθ = 1, then all possible values of tanθ, is/are where 8 € (-π/2,π/2)

A. 1
B. 3
C. 2
D. 4

Ans. C

Ques 9. Given data 60, 60, 44, 58, 68, α, ß, 56 has mean 58, variance = 66.2 then find $\alpha^2 + ß^2$

Ans. 7182

Ques 10. If : |z + 1| = αz + ß(i + 1) and z = 1/2 - 2i, find α + ß.

Ans. 3

Ques 11. In an increasing arithmetic progression a1, a2,..., an if a6 = 2 and product of a1, a5 and a4 is greatest, then the value of d is equal to

A. 1.6
B. 1.8
C. 0.6
D. 2.0

Ans. A

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Ques 12. If relation R : (a, b)R(c, d) is only if ad - bc is divisible by 5, (a, b, c, d ∈ Z) then R is:

- **A. Reflexive**
- **B. Symmetric, Reflexive but not Transitive**
- **C. Reflexive, Transitive but not Symmetric**
- **D. Equivalence Relation**

Ans. B

Ques 13. If f(x)= $\begin{cases} 2+2x & ;x \in (-1,0) \\ 1-\frac{x}{3} & ;x \in [0,3) \end{cases}$ **and g(x)=** $\begin{cases} x & ;x \in [0,1) \\ -x & ;x \in (-3,0) \end{cases}$ **Then range of fog(x) is**

- **A. [0, 1]**
- **B. (0,1]**
- **C. [-1,1]**
- **D. (-1,1)**

Ans. C

Ques 14. If $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(\frac{x^2 \cos x}{1+\pi^x} + \frac{1+\sin^2 x}{1+e^{(\sin x)^{2023}}} \right) dx = \frac{\pi}{4}(\pi + \alpha) - 2$ **Then the value of 'a' is equal to**

- **A. 1**
- **B. 2**
- **C. 3**
- **D. 4**

Ans. C

Ques 15. Area under the curve x ^ 2 + y ^ 2 = 169 and below the line 5x - y = 13 is:

- **A. (169π)/4 - 65/2 + 169/2 $\sin^{-1}$(12/13)**

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B. $(169\pi)/4 + 65/2 - 169/2 \sin^{-1}(12/13)$
C. $(169\pi)/4 - 65/2 + 169/2 \sin^{-1}(13/14)$
D. $(169\pi)/4 + 65/2 + 169/2 \sin^{-1}(13/14)$

Ans. A

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