JEE Main 2024 Question Paper April 5 Shift 1 (B.E./B.Tech)

JEE Main Physics Questions

Ques 1. The ratio of radius of gyration of uniform hollow sphere and uniform solid sphere about its diameter is _____ (both have the same radius)

    A. $\sqrt{4/3}$
    B. $\sqrt{5/3}$
    C. $\sqrt{3/2}$
    D. $\sqrt{3/5}$

Ans. B

Ques 2. If the time period of a pendulum at height R (Where R is radius of earth) from surface of earth is T_1 and at height 2R it is T_2, then

    A. $3T_1 = 2T_2$
    B. $2T_1 = 3T_2$
    C. $T_1 = 3T_2$
    D. $3T_1 = 4T_2$

Ans. A

Ques 3. A point source of light is placed at focus of convex lens, then what is the shape of wavefront after passing through the lens?

A. Planer

B. cylindrical

C. spherical

D. elliptical

Ans. A

Ques 4. Find dimension of √G.μ, where G is universal gravitational constant and μ is energy gradient

A. $[LT^{-2}]$

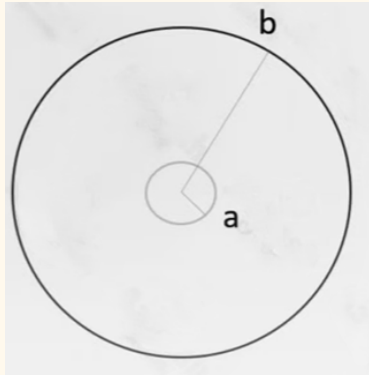B. $[L^2T^{-2}]$

C. $[LT^{-3}]$

D. $[LT^{-1}]$

Ans. B

Ques 5. A block of mass m = 50 kg is lifted from ground to a height of 20 m in two different ways as shown in the figure. Find the ratio of work done by gravity in both the cases.
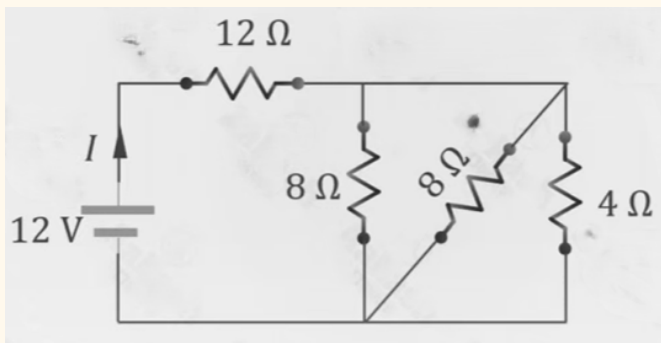

A. 1 : 1

B. 1 : 2

C. 2 : 1

D. 1 : 5

Ans. A

Ques 6. Two concentric conducting rings of radius a and b are placed as shown in diagram (a << b). Find coefficient of mutual inductance of rings

A. $\mu_0 \pi b^2 / a$
B. $\mu_0 \pi a^2 / 2b$
C. $\mu_0 a^2 / 2b$
D. $\mu_0 a^3 / 2\pi b^2$

Ans. B

Ques 7. Find the current I in the given circuit
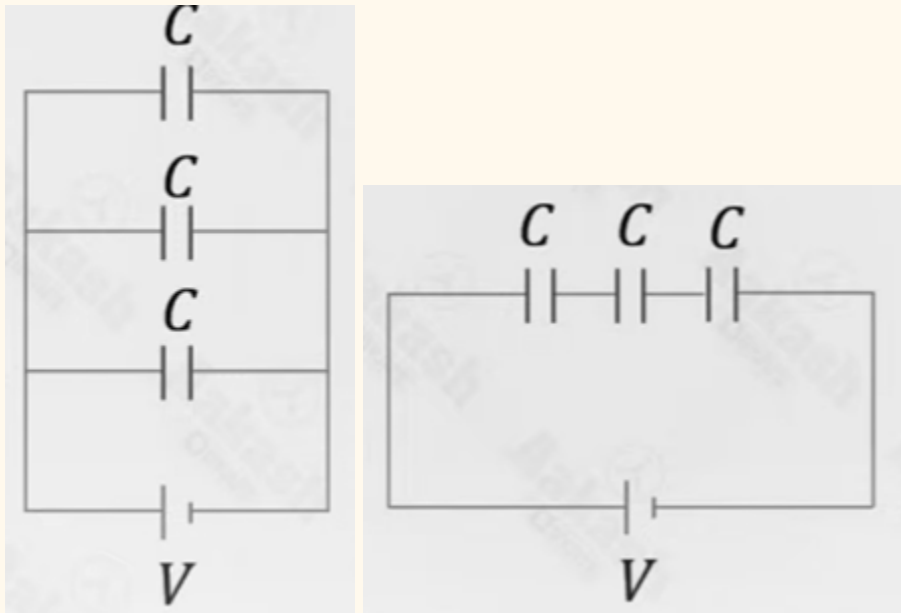

A. 12/13 A
B. 6/7 A
C. 5/6 A

D. 7/8 A

Ques 8. The correct relation between kinetic energy (K.E) and total energy (T.E) of a satellite orbiting around the planet is

    A. K.E = |T.E|
    B. K.E = 2|T.E|
    C. K.E = |T.E| / 2
    D. |T.E|=3K.E

Ans. A

Ques 9. Find the ratio of energy stored in the two given capacitor systems.

    A. 2:1
    B. 4:1
    C. 9:1

D. 1:1

Ans. C

Ques 10. Three helium atoms from carbon at high temperature due to fusion. Masses of helium and carbon nuclei a.m.u are 4.0002 and 12 respectively . Find energy released in the process

    A. 0.18 MeV
    B. 0.56 MeV
    C. 0.10 MeV
    D. 21.3 KeV

Ans. B

Ques 11. In YDSE for wavelength λ = 5000 A , slit distance d = 3 mm and screen distance of 2 m, the intensity at a point which is 3 cm away from central maxima (assume intensity of light for each source is I_0) is xI_0 then x is

Ans. 4

Ques 12. Match the column. [Given: mass of sun = Ms | mass of earth = Me | Radius of earth = R | Distance between the Sun and the Earth = a]

    A. Kinetic energy of Earth
    B. Potential energy of Earth and Sun
    C. Total energy of Earth and Sun
    D. Escape energy from surface of Earth per unit mass

    1. -GMsMe / a

2. GMsMe / 2a
3. GMe / R
4. GMsMe / 2a

A. A →3,B →1,C→ 2, D → 4
B. A → 1,B → 2,C→ 4,D→ 3
C. A → 2, B →1, C → 4,D → 3
D. A → 2, B → 1, C → 3,D → 4
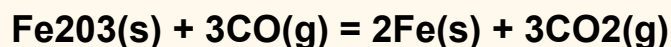
Ans. C

JEE Main Chemistry Questions

Ques 1. Which metal shows the highest and maximum number of oxidation states?

A. Mn
B. Fe
C. Co
D. Cr

Ans. A

Ques 2. Consider the reaction:

$Fe_2O_3(s) + 3CO(g) = 2Fe(s) + 3CO_2(g)$

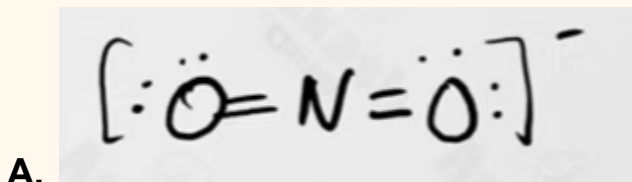**Which of the following will not affect the equilibrium state:**
(I) Addition of Fe_2O_3
(II) Addition of CO_2

(III) Decreasing mass of Fe2O3
(IV) Removal of CO

    A. (II) and (IV)
    B. (I) and (IV)
    C. (I) and (III)
    D. All will affect the equilibrium

Ans. C

Ques 3. Identify the correct Lewis dot structure of NO$_2^-$.

A.

$$\left[\cdot \ddot{O} = N = \ddot{O} \colon \right]^-$$

B.

$$\left[\ddot{O} - \ddot{N} = \ddot{O} \right]^-$$

C.

$$\left[\cdot \ddot{O} - N - \ddot{O} \colon \right]^-$$

D.

$$\left[\colon \ddot{O} = \ddot{N} = \ddot{O} \colon \right]^-$$
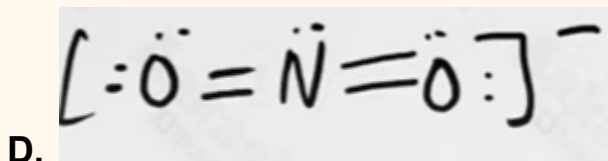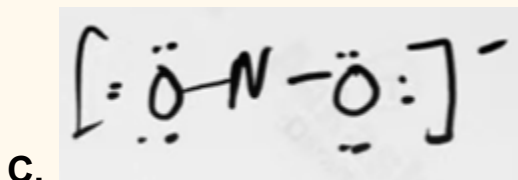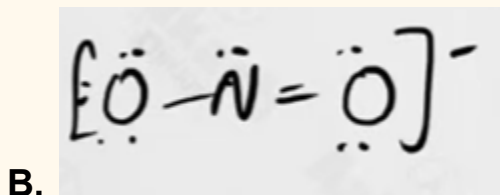
Ans. B

Ques 4. Sum of O atoms in A and B is ?
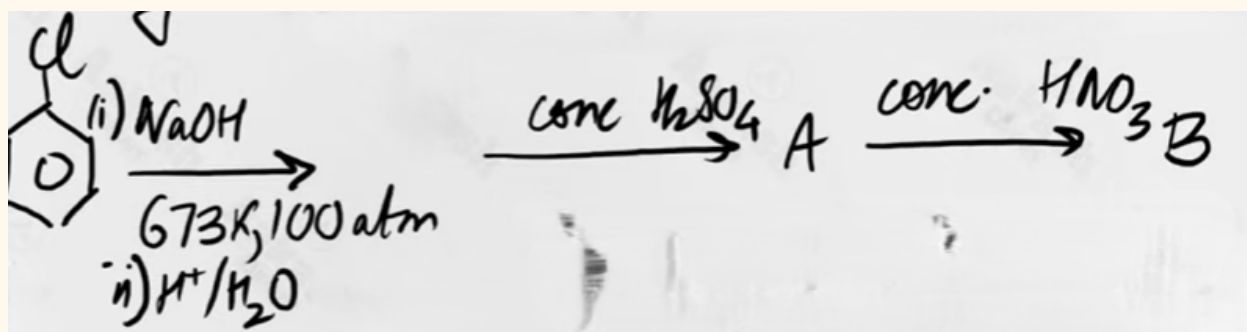
Ans. 14

Ques 5.
Assertion: Trans But-2-ene is less polar than cis But-2-ene

Reason: Trans But-2-ene has zero dipole moment

    A. Both assertion and reason are true and reason is correctionexplanation of assertion
    B. Both assertion and reason are true and reason is not the correction explanation of assertion
    C. Assertion is true and reason is false
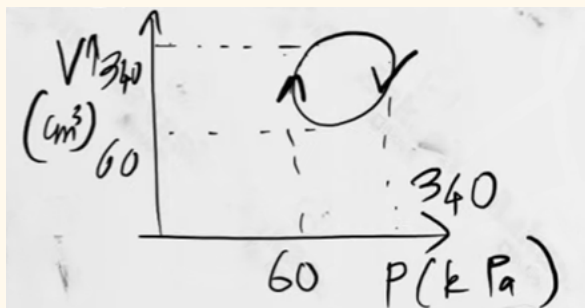   D. Assertion is false and reason is true

Ans. A

Ques 6. What is the correct order of strength of following ligands according to the spectrochemical series?

    A. $CN^- < OH^- < F^- < Cl^- < I^-$
    B. $I^- < Cl^- < F^- < OH^- < CN^-$
    C. $I^- < Cl^- < F^- < CN^- < OH^-$
    D. $F^- < Cl^- < I^- < OH^- < CN^-$

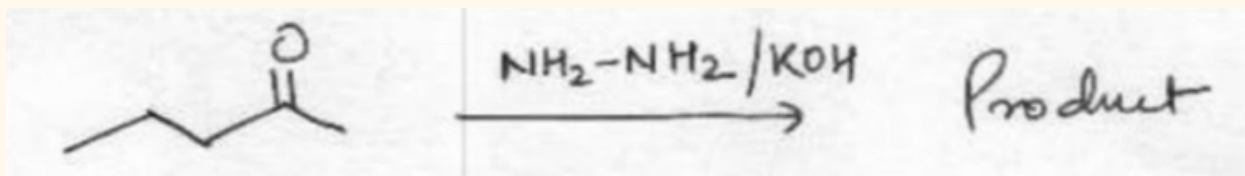**Ans.** B

Ques 7. Find out the work done in the following process.

    A. 61.5 Joule
    B. -61.5 Joule
    C. +246 Joule
    D. -246 Joule

Ans. A

Ques 8.

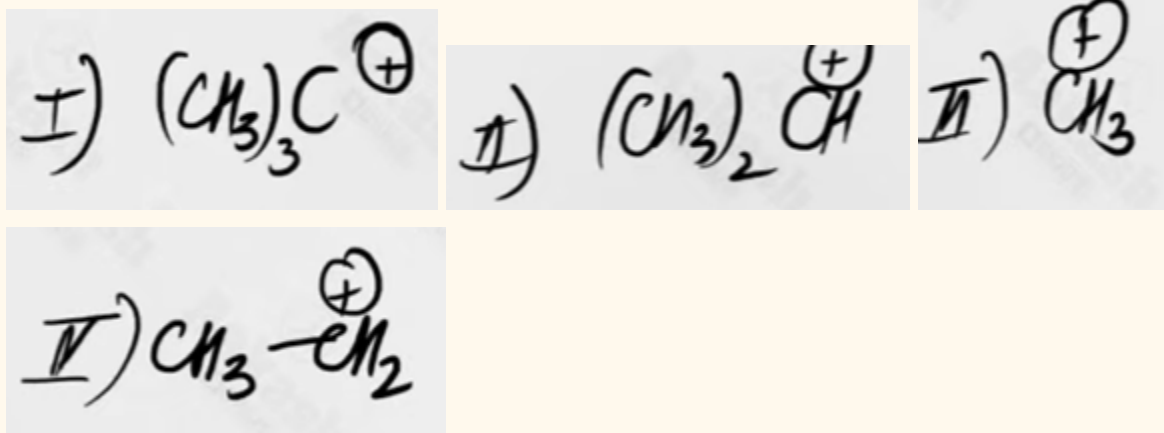   A. Alcohol
    B. Alkane
    C. Alkene
    D. Ester

Ans. B

Ques 9. If the number of neutrons in the most abundant isotope of boron is 'x' and its highest oxidation state in unsaturated compound is 'y', then find the value of (x+y).

    A. 6
    B. 4
    C. 3
    D. 9

Ans. D

Ques 10. Arrange the following carbocations in increasing order of their stability.

$$I) \ (CH_3)_3C^{\oplus} \qquad II) \ (CH_3)_2 \overset{+}{C}H \qquad III) \ \overset{+}{C}H_3$$

$$IV) \ CH_3 - \overset{\oplus}{C}H_2$$

    A. I < II< IV< III
    B. I < II < IV < I
    C. II < I < III < IV
    D. III < IV < II < I

Ans. D

Ques 11. Which postulate of Dalton's theory is wrong

    A. Matter consist of indivisible atoms

B. All atoms of a given element have identical properties butdifferent masses
C. Compounds are formed when atoms of different elementscombines in a fixed ratio
D. Chemical reaction involve reorganisation of atoms

Ans. B

Ques 12. In which of the following compounds Mn has the highest oxidation state?

A. MnO_4
B. MnO_2
C. MnO_4^{2-}
D. Mn_2O_3

Ans. A

Ques 13. Which of the following cation will give green colour in Borax bead test

A. Iron
B. Cobalt
C. Manganese
D. Nickel

Ans. A

Ques 14. Sum of the number π and nt bonds in the ethylene molecule is x. The value of x is

Ans. 6

Ques 15. One litre solution of 0.2 M glucose is separated with its pure solvent with semi-permeable membrane, 0.1 moles of NaCl is added to the solution. The change in osmotic pressure of solution will be at 300 K _____ . (take R = 0.083)

Ans. 5

Ques 16.
Consider the following statements:

Statement I: Stability of +1 oxidation state increases down the group in group-13.

Statement II: Atomic radius of Ga is greater than that of Al.

   A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
   B. Both statements 1 and 2 are true and statement 2 is not the correct explanation of statement 1.
   C. Statement 1 is true but statement 2 is false.
   D. Statement 1 is false but statement 2 is true.

Ans. C

Ques 17. The molar conductivities of a divalent cation (M^{2+}) and monovalent anion (A^-) are 57 S cm^{-1} mol^{-1} and 73 S cm-1 mol^{-1} respectively. Then find the total molar conductivity shown by their compound in S cm^{-1} mol^{-1}

Ans. 203

Ques 18. Identify the change occuring in oxidation state of Mn in cell reaction of dry cell of clock during its use

   A. +3 → +4

B. +2 → +7
C. +4 → +3
D. +7 → +2

Ans. C

JEE Main Mathematics Questions

Ques 1. The value of

$$\int_0^{\frac{\pi}{4}} \frac{dx}{1+\tan x}$$

equals to?

A. $\pi/8 + \ln 2$
B. $\pi/4 + \ln 2$
C. $\pi/8 + 1/2 \ln 2$
D. $\pi/8 + 1/4 \ln 2$

Ans. D

Ques 2. $\int_{-\pi}^{\pi} \frac{2x(1+\sin x)}{(1+\cos^2 x)} dx$ **is equal to?**

A. π^2
B. 2π
C. $3\pi/2$
D. $\pi^2/2$

Ans. A

Ques 3. If dy/dx +2y = sin 2x and y(0) = 3/4 , then y (π/8) is equal to:

    A. $e^{\pi/8}$
    B. $e^{\pi/6}$
    C. $e^{-\pi/4}$
    D. None

Ans. C

Ques 4. If f(x)= x^5 + $2x^3$ + 3x + 1 and g(f(x)) = x, then g(1)/g'(1) is equal to

Ans. 0

Ques 5. Consider the equation ax^2 + bx + c = 0 . Find probability if a, b, c є A where A = {1,2,3, ... , 8} that the equation has equal roots.

    A. 1/512
    B. 1/64
    C. ⅛
    D. ¼

Ans. B

Ques 6. Let f(x) = x^2 - 5x and g(x) = 7x - x^2, then the area between the curves equals to:

    A. 36
    B. 70
    C. 72
    D. 50

Ans. C

Ques 7. When 4 dice are rolled, then the probability of 16 as a sum is:

    A. $5^4 / 6^4$
    B. $5^3 / 6^4$
    C. $5^2 / 6^4$
    D. $5 / 6^4$

Ans. B

Ques 8. A rectangle ABCD with ABCD with AB = 2 and BC = 4 is inscribed in rectangle PQRS such that vertices of ABCD lie on sides of PQRS then maximum possible area(in sq. unit) of rectangle PQRS is :

    A. 9
    B. 20
    C. 18
    D. 12

Ans. C

Ques 9. Two lines passing through (2, 3) parallel to coordinate axes. A circle of unit radius touches both the lines and lies on the origin side. Then the shortest distance of point (5,5) from the circle is:

    A. 2
    B. 3
    C. 4
    D. $\sqrt{13}$

Ans. C

Ques 10. If f(1) = 1,

$$\lim_{t \to x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1$$

, ,then 2f(2) + 3f(3) equals to:

    A. 1
    B. 7
    C. 9
    D. 13

Ans. D

Ques 11. Find the numbers of distinct real roots |x||x + 2| - 5|x + 1| - 1 = 0.

Ans. 3