JEE Main 2024 Question Paper April 4 Shift 2 (B.E./B.Tech)

JEE Main Physics Questions

Ques 1. A massless rod has a point mass attached to one end while the other end is hinged. The rod is released from the position shown. The speed of the mass at the bottom most point is (R = 14 m, g = 10 m/s^2)

    A. $\sqrt{560}$ m/s
    B. $\sqrt{280}$ (1 + 1/$\sqrt{2}$) m/s
    C. $\sqrt{280}$ m/s
    D. $\sqrt{280}$ (1 + 1/$\sqrt{3}$) m/s

Ans. B

Ques 2. P, Q, R, S are 4 symmetric points on a horizontal circle of radius of 4 km. What is the displacement when a car moves from P to R along the given circular path.

    A. 4$\sqrt{2}$ km
    B. 4 π km
    C. 8 km
    D. 4 km

Ans. C

Ques 3. One mole of an ideal monatomic gas compressed adiabatically from volume 2 V to V . If initially temperature of gas was T then the magnitude of work done in this process is

A. 3/2 RT (2$^{1/2}$ - 1)
B. 3/2 RT (2$^{2/3}$ - 1)
C. 2/3 RT (2$^{2/3}$ - 1)
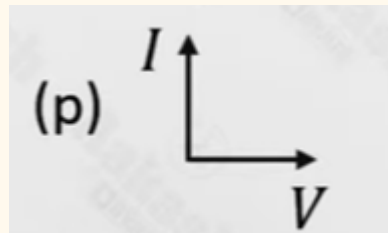D. 2/3 RT ($\sqrt{2}$ - 1)

Ans. B

Ques 4. A 2 kg brick is placed on an inclined plane of inclination 45°. The brick is at rest. The minimum coefficient of static friction is:
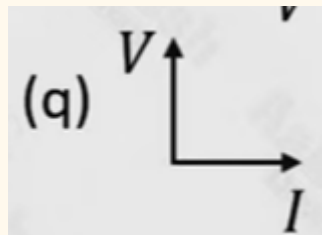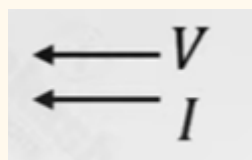
A. 0.5
B. $\sqrt{3}$
C. 1
D. 1/$\sqrt{3}$

Ans. C

Ques 5. Correct match for phasors of voltage and current for given elements is

a. Inductive

b. Capacitive

C. Resistive

A. a → p,b → q,c→r
B. a → q,b → p,c→r
C. a → p,b → p,c→r
D. a→q,b→q, c→r

Ans. B

Ques 6. Assertion (A) : The contact angle depends on material of solid and liquid.
Reason (R) : Height of the liquid in a capillary tube is independent of the radius of the tube.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

Ans. C

Ques 7. A metallic rod of length 4 m is rotating about perpendicular bisector of the rod with angular velocity of 2 rad/s in presence of transverse magnetic field of 0.5 T. Potential difference developed across ends of rod is
   A. 16 V
   B. 8 V
   C. 0 V
   D. 32 V

Ans. C

Ques 8. Statement 1 : In photoelectric effect, number of photoelectrons emitted are proportional to frequency of incident light.

Statement 2 : Maximum kinetic energy of photoelectrons is proportional to frequency of incident light.

    A. Statement 1 is true and Statement 2 is true and correct explanation of 1

    B. Statement 1 is true and Statement 2 is true and not correct explanation of 1

    C. Statement 1 is true and Statement 2 is false

    D. Statement 1 is false and Statement 2 is true

Ans. D

Ques 9. The circuit diagram shown is equivalent to
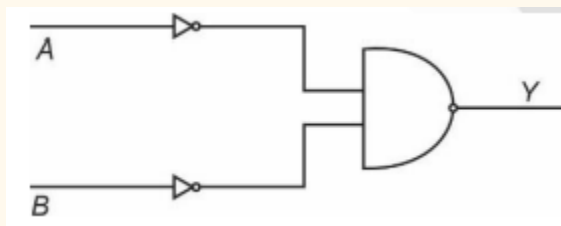
    A. OR

    B. NOR

    C. AND

    D. NAND

Ans. A

Ques 10. The width of the one slit in YDSE is four times the other slit. Then ratio of maximum to the minimum intensity at screen is

    A. 9 : 1

    B. 16 : 1

    C. 4 : 1

    D. 1 : 1

Ans. A

Ques 11. Wavelengths assigned to gamma rays, infra-red rays, UV rays and microwaves are 1 , 2 , 3 & 4 respectively. Then :

A. 1 < 2 < 3 < 4

B. 1 < 3 < 2 < 4

C. 1 > 2 > 3 > 4

D. 2 < 3 < 1 < 4

Ans. B

Ques 12. A heater of rating of 50 W – 200 V is connected with source voltage of 100 V. Power consumed by heater is
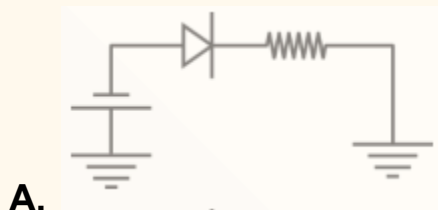
A. 100 W

B. 25 W

C. 50 W

D. 12.5 W

Ans. D

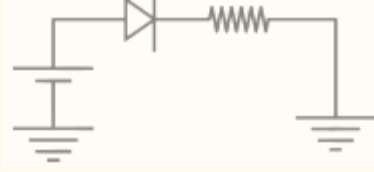**Ques 13. With regard to gravitation parameters, the dimensions of T^2 are same as that of**

A. r^3 /GM

B. GM/r^3

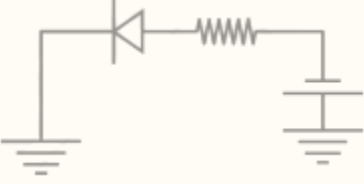C. $r^{3/2}$ /GM

D. r^2/GM

Ans. A

Ques 14. Which of the following circuits would have the diode in conducting state?

A.

B.

C.

D.

Ans. B

Ques 15. Two point mass m and 2m are on straight line. If mass m moves toward centre of mass by distance 2 cm, then the distance must mass 2m should move so that centre of mass does not change _____ cm.

Ans. 1

Ques 16. A body of mass 4 kg is at a height of R (radius of earth) from surface of earth. The weight of the body is _____ N.

Ans. 10

Ques 17. A bar magnet of magnetic moment $M = 0.5A\ m^2$ is under the influence of a magnetic field 8 T. Find the work done (J) to move the magnet from stable to unstable equilibrium position.

Ans. 8

Ques 18. For methane, translation degrees of freedom is f1 while rotational degrees of freedom is f2 . Find f1 + f2 .
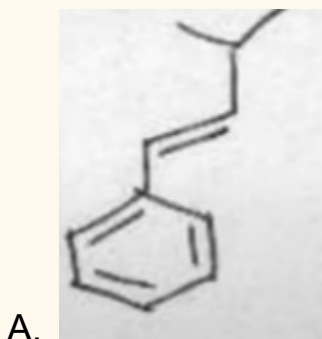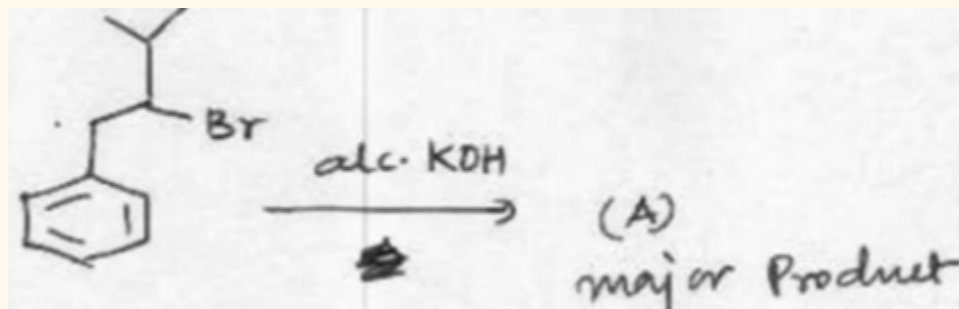
Ans. 6

Ques 1. Which of the following have a pyramidal shape ?

    A. a) $S_2O_3^{2-}$
    B. SO_4^{2-}
    C. SO_3^{2-}
    D. $S_2O_7^{2-}$

Ans. D

Ques 2. Major product A is

A.

B.

C.

D.
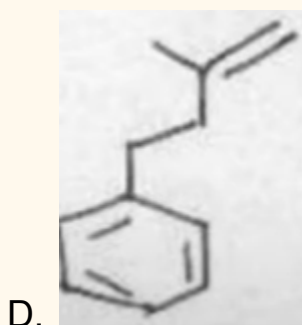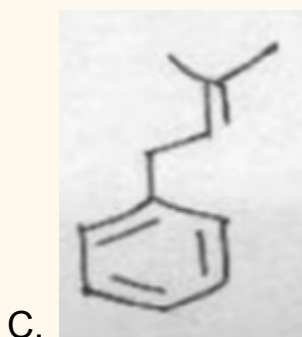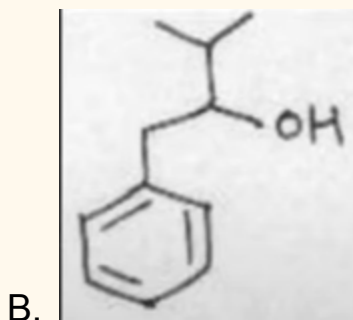
Ans. A

Ques 3. IUPAC name of Catechol is-

    A. Benzene, 1,2-diol
    B. Benzene-1,3-diol
    C. Benzene -1,4-diol
    D. 3-Hydroxyphenol

Ans. A

Ques 4. The correct order of ionisation enthalpy for Li, Na, Cl, F is:

A. Na < Li < Cl < F
B. Li < Na < Cl < F
C. Na < Li < F < Cl
D. F < Cl < Li < Na

Ans. A

Ques 5. What is the sum of number of α and π bonds present in 2-oxo-hex-4-yne-oic acid ?

Ans. 18

Ques 6. Consider the following statements:

Statement I: The number of emitted photoelectrons Increases with increase in frequency of incident light.

Statement II: Kinetic energy of emitted photoelectrons increases with increase in frequency of incident light

A. Statement I is true but statement II is false
B. Statement I is false but statement II is true
C. Both Statement I and statement II are true
D. Both Statement I and statement II are false

Ans. B

Ques 7. Which of the following is used as adsorbent in adsorption chromatography?

A. Silica Gel
B. Alumina
C. Benzene
D. Both A and B

Ans. D

Ques 8. What is the maximum amount of acetanilide formed when acetic anhydride in excess is treated with 18 gm of aniline. (nearest integer)

Ans. 26

Ques 9. Maximum number of orbitals possible when n = 4 and m = 0?

Ans. 4

Ques 10. How many of the given statements are true for fuel cell?
    A. It is a type of Galvanic cell
    B. It is used for providing electrical power in space programmes.
    C. Hydrogen and oxygen are bubbled through porous carbon
       electrodes into concentrated NaOH solution
    D. It produces electricity with an efficiency of 40%
    E. It is pollution free cell

Ans. 4

Ques 11. An element of d-block (Z) of 4th period has spin only magnetic moment of its Z^{3+} form is 3.9 BM, then find minimum atomic number of element (Z).

Ans. 24

Ques 12. Which one of the following has the most negative (highest –ve) electron gain enthalpy?
    A. Li
    B. Na
    C. F
    D. Cl

Ans. D

Ques 13. Find out number of unpaired electrons in d-subshell for [Co(H2O)6] 3+.
    A. 3
    B. 4
   C. 0
    D. 2

Ans. C

Ques 14. 9. Which of the following statement is INCORRECT
    A. In homogeneous mixture, Composition is uniform
    B. Compounds are formed when atoms of different elements combine together in any ratio
    C. Atoms of same element have identical atomic mass and properties
    D. In heterogeneous mixture, Composition is not uniform

Ans. B

Ques 15. Arrange the following anions in the decreasing order of their stability.
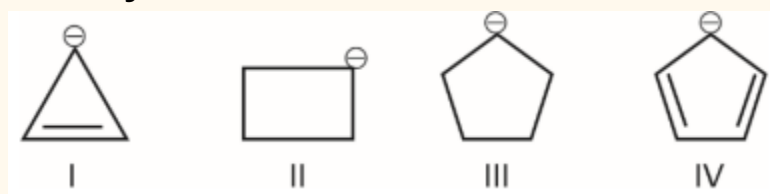
    A. I > II > III > IV
    B. IV > III > II > I
    C. III > II > I > IV
    D. II > IV > III > I

Ans. B

Ques 1. If a, b, c are in A. P. and a + 1, b, c + 3 are in G. P., arithmetic mean of a, b, c is 8, then the value of cube of geometric mean of a, b, c is:

    A. 312
    B. 314
    C. 318
    D. 128

Ans. A

Ques 2. If $\int_{-1}^{1} \frac{\cos \alpha x}{1+3^x} dx = \frac{2}{\pi}$ then α is

    A. π/6
    B. π/2
    C. π/3
    D. Π

Ans. B

Ques 3. If coefficient of x^4, x^5, x^6 of $(1 + x)^n$ are in A.P., then maximum value of n is equal to

    A. 28
    B. 21
    C. 14
    D. 7

Ans. C

Ques 4. Let relation defined as (x1, y1) R (x2, y2) x1 ≤ x2, y1 ≤ y2 and given that
(a) R is reflexive but not symmetric.
(b) R is transitive.
then

    A. (a) is true, (b) is false
    B. (a) is false, (b) is true
    C. Both are true
    D. Both are false

Ans. C

Ques 5. The value of

$$\frac{1 \times 2^2 + 2 \times 3^2 + \ldots + 100 \times (101)^2}{1^2 \times 2 + 2^2 \times 3 + \ldots + 100^2 \times 101}$$

    A. 305/301
    B. 301/305
    C. 350/310
    D. 310/350

Ans. A

Ques 6. A parabola $y^2 = 12x$ has a chord PQ with mid-point (4, 1) then equation of PQ passes through

    A. (½, -20)
    B. (½, -10)
    C. (10, -½)
    D. (-10, -½)

Ans. A

Ques 7. Team A plays 10 matches, probability of winning is 1/3 and losing is ⅔. They win x matches and lose y matches. Probability such that |x − y| ≤ 2 is P then find 3^9P.

    A. 8288
    B. 8381
    C. 8461
    D. 8911

Ans. A

Ques 8. For a hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$ **, C1 is a circle touching hyperbola having centre at origin and C2 is circle centred at four and touching hyperbola at vertices, if area of C1 = 36π and area of C2 = 4π. Find a2 + b2 = ?**

    A. 40
    B. 43
    C. 64
    D. 56

Ans. C

Ques 9. Find area bounded by y2 ≤ 2x and y ≥ 4x − 1

    A. 9/ 32
    B. 11/ 32
    C. 11/ 8
    D. 11/ 3

Ans. A

Ques 10. (x2 + 1)2dy + (y(2x3 + x) − 2)dx = 0, y(0) = 0, then y(2) is equal to

    A. 2/5 $\tan^{-1}$2
    B. ⅗ $\tan^{-1}$2
    C. 2/5 $\tan^{-1}$3

D. 3/5 tan⁻¹3

Ans. A

Ques 11. If a, b, c are in increasing A.P. and a + 1, b, c + 3 are in G.P. If A.M. of a, b, c is 8. Find cube of G.M. of a, b, c.
   A. 123
   B. 312
   C. 415
   D. 213

Ans. B

Ques 12. The radius of a circle is √10 . x + y = 4 is the line intersecting the circle at P & Q. A chord MN is of length 2 m having slope –1. Find perpendicular distance between the two chords PQ and MN.
   A. 2
   B. 3
   C. 4
   D. 5

Ans. B

Ques 13. In group A there are 4 men and 5 women and in group B there are 5 men and 4 women, if 4 people are selected from each group. Find a number of ways to select 4 men and 4 women.

Ans. 5626

Ques 14. If f(x)= 3√(x-2)+√4-x If minimum value = α Maximum value = β find α2 + β2

Ans. 22

Ques 15. If f(x) = $\begin{cases} \dfrac{(72)^x - 9^x - 8^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}} & ; x \neq 0 \\ a \log 2 \log 3 & ; x = 0 \end{cases}$ **is continuous at x = 0. Then a2 equals to**

    A. 1152

    B. 572

    C. 1225

    D. 1005

Ans. A