

JEE Main 2024 Question Paper Feb 1 Shift 2 (B.E./B.Tech)

JEE Main Physics Questions

Ques 1. Two trains run on North-South parallel tracks. Train A moves with velocity 20 m/s towards North and train B moves with velocity 30 m/s towards South. Then find the velocity of train B with respect to train A.

Ans. 50 m/s

Ques 2. A body of mass of 4kg experiences two forces

$$\vec{F}_1 = 5\hat{i} + 8\hat{j} +$$

$$7\hat{k}, \text{ \& } \vec{F}_2 = 3\hat{i} - 4\hat{j} - 3\hat{k}$$

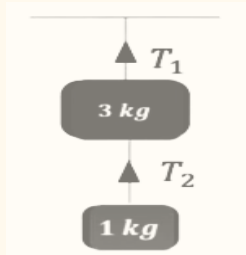
then acceleration acting on the body R

Ans. $\sqrt{6}$

Ques 3. A source produced electromagnetic wave of frequency 60MHz. Find the wavelength of this wave in air.

Ans. 5 m

Ques 4. In the figure shown, find the ratio of tensions in the strings, T_1/T_2



A. $\frac{1}{4}$

- B. $\frac{1}{2}$
- C. $\frac{1}{3}$
- D. 4

Ans. D

Ques 5. A Big drop is formed by coalescing 1000 small droplets of water. The surface water. The surface energy will become.

Ans. $1/10$.

Ques 6. A solid sphere is rolling purely with speed v on horizontal surface. It rolls up an incline surface and stops at height h . Then height h is [g is the acceleration due to gravity]:

- A. $3 v^2/10 g$
- B. $7 v^2/10 g$
- C. $5v^2/7 g$
- D. $7v^2/5 g$

Ans. B

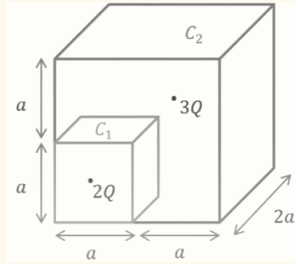
Ques 7. If the power of a light source is P and frequency of photons emitted is f .

Find number photons emitted in time t .

- A. $Pt/2hf$
- B. Pt/hf
- C. $1pf/2 ht$
- D. Pf/ht

Ans. B

Ques 8. There are two cubical Gaussian surface carrying charges as shown. Find ratio of fluxes through surface C_1 and C_2 :



- A. 1:1
- B. 2:5
- C. 5:2
- D. 2:3

Ans. B

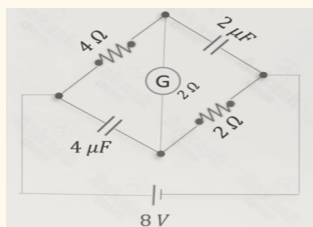
Ques 9. Find the number of significant digits in the value 10.05 :

Ans. 4

Ques 10. A ball of mass 120 g moving with initial velocity 25 m/s is stopped by an external force F in 0.15 sec. Find value of F in newton :

Ans. 20

Ques 11. Find the ratio of the charge on $4 \mu\text{F}$ to that on $2 \mu\text{F}$ in steady state.



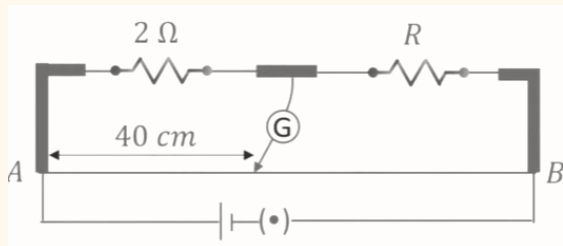
Ans. 3

Ques 12. If the rms velocity of hydrogen gas molecules is V_0 , find the rms velocity of oxygen molecules at same temperature :

- A. V_0
- B. $V_0/2$
- C. $V_0/4$
- D. $V_0/3$

Ans. C

Ques 13. In the meter bridge shown below, the null point is at 40 cm from A. If R is shunted by 2Ω , find the distance of new balance point from A



- A. 22.7 cm
- B. 60 cm
- C. 62.5 cm
- D. 60.5 cm

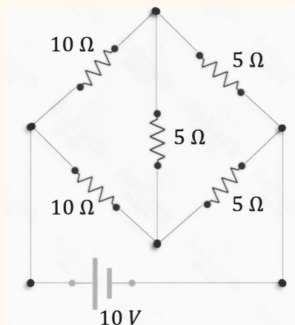
Ans. C

Ques 14. A particle is moving in circular path of radius r speed v such that speed is proportional to radius as $V \propto r^{3/2}$. Then how does time period of revolution depends on r i.e $T \propto r^n$ then n is.

- A. $-1/2$
- B. $5/2$
- C. $-5/2$
- D. $1/2$

Ans. B

Ques 15. In the given circuit, find electric current drawn from battery:
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- A. $\frac{3}{4}$ A
- B. $\frac{4}{3}$ A
- C. $\frac{4}{5}$ A
- D. $\frac{5}{4}$ A

Ans. B

JEE Main Chemistry Questions

Ques 1. Number of radial nodes present in 3p are

- A. 0
- B. 1
- C. 2
- D. 4

Ans. B

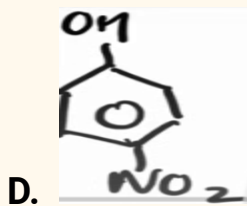
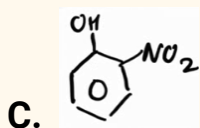
Ques 2. Which of the following compounds have colour due to d-d transition?

- A. KMnO_4
- B. $\text{K}_2\text{Cr}_2\text{O}_7$
- C. K_2CrO_4
- D. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Ans. D

Ques 3. Which of the following compounds has intramolecular hydrogen bonding in it?

- A. NH_3
- B. H_2O



Ans. B

Ques 4. Which of the following has the highest 3rd ionization energy?

- A. Mn
- B. V
- C. Cr
- D. Fe

Ans. A

Ques 5. A 10 mL hydrocarbon (C_xH_y) on combustion give 40 mL CO_2 and 50 mL H_2O . Calculate the value of $x+y$

Ans. 14

**Ques 6. Solubility of $\text{Ca}_3(\text{PO}_4)_2$ in 100 mL of pure water is W gm. Find out K_{sp} of $\text{Ca}_3(\text{PO}_4)_2$ is:
(M: Molecular mass of $\text{Ca}_3(\text{PO}_4)_2$)**

- A. $108 * (\text{W}/\text{M})^5$
- B. $108 * 10^5 * [\text{W}/\text{M}]^5$
- C. $108 * 10^4 * [\text{W}/\text{M}]^5$
- D. $108 * 10^6 * [\text{W}/\text{M}]^5$

Ans. B

Ques 7. Which of the following sets of elements can be detected by Lassaigne's Test ?

- A. N and S only
- B. N, P and S only
- C. P and halogens only
- D. N, P, S and halogens

Ans. D

Ques 8. Which of the following compounds in 3d series does not show +3 oxidation state?

- A. V
- B. Cr
- C. Mn
- D. Cu

Ans. D

Ques 9. What is the order of reducing character for AsH_3 , NH_3 , PH_3 (group 15 hydrides)?

- A. $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3$

- B. $\text{PH}_3 > \text{NH}_3 > \text{AsH}_3$
- C. $\text{AsH}_3 > \text{PH}_3 > \text{NH}_3$
- D. $\text{NH}_3 > \text{AsH}_3 > \text{PH}_3$

Ans. C

Ques 10. Which of the following compounds has the highest boiling point?

- A. Butanol
- B. Diethylether
- C. Butane
- D. Butanol

Ans. A

Ques 11. Consider the following two statements

Statement I: π 2p bonding molecular orbital has low electron density above & below internuclear axis

Statement II: π^*2p antibonding molecular orbital has only one nodal plane

- A. Both Statement I and Statement II are correct
- B. Both Statement I and Statement II are incorrect
- C. Statement I is incorrect, but Statement II is correct
- D. Statement I is correct, but Statement II is incorrect

Ans. B

Ques 12. Consider the following two statements

Statement I: SiO_2 and GeO_2 are acidic, SnO and PbO are amphoteric

Statement II: Allotropes of carbon are formed due to catenation and $d\pi - p\pi$ bond

- A. Both Statement I and Statement II are correct
- B. Both Statement I and Statement II are incorrect
- C. Statement I is correct, but Statement II is incorrect
- D. Statement I is incorrect, but Statement II is correct

Ans. C

Ques 13. Consider the following two statements

Statement I: In p and d block both metals and non - metals are present

Statement II: Electronegativity and ionisation enthalpy of metals is greater than non - metals

- A. Both Statement I and Statement II are correct**
- B. Both Statement I and Statement II are incorrect**
- C. Statement I is correct, but Statement II is incorrect**
- D. Statement I is incorrect, but Statement II is correct**

Ans. B

Ques 14. Ethylene glycol of x kg is mixed with 18.6 kg of solvent, 24 °C depression in freezing point takes place.

Calculate value of x.

(Given: $K_f = 1.6 \text{ }^\circ\text{C/molal}$ M.W. of ethylene glycol = 62 g/mol)

Ans. 17

Ques 15. Find out charge (in C) required for electrolysis of 1 mole of H_2O to produce O_2 on one of the electrodes. ($F = 96500 \text{ C}$)

Ans. 193000

JEE Main Mathematics Questions

Ques 1. Let α and β the roots of equation $px^2 + qx - r = 0$, where $P \neq 0$. If p, q, r be the consecutive term of non constant G.P and $1/\alpha + 1/\beta = 3/4$ then the value of $(\alpha - \beta)^2$ is:

Ans. 80/9

Ques 2. If the mirror image of the point $P(3,4,9)$ in the Line

$$\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-2}{1}$$

is (α, β, γ) then find $14(a+\beta+y)$ is:

Ans. 108

Ques 3. The number of solution of the equation

$$4\sin^2 x - 4\cos^3 x + 9 - 4\cos x = 0, x \in [-2\pi, 2\pi]$$

is:

Ans. 0

Ques 4. If the domain of the function

$$f(x) = \frac{\sqrt{x^2-25}}{(\sqrt{4-x^2})} + \log(x^2 + 2x - 15) \text{ is } (-\infty, \alpha) \cup (\beta, \infty), \text{ then}$$

$\alpha^2 + \beta^2$ is equal to b

Ans. 50

Ques 5. Let the system of equations $x+2y+3z = 5$, $2x+3y+z = 9$, $4x+3y+\lambda z = \mu$ have an infinite number of solutions. Then $\lambda + 2\mu$ is equal to

Ans. 17

Ques 6. The value of integrate $\int_0^1 (2x^3 - 3x^2 - x + 1)^{1/3} dx$ is :

- A. -1
- B. 1
- C. 0
- D. 2

Ans. 0

Ques 7. The probability that Ajay will not go to office is $\frac{1}{5}$ and probability that Ajay and Vijay will not go to the office is $\frac{2}{7}$, if their visits to office is independent of each other, then find the probability that Ajay will go to the office, but Vijay will not go, is

- A. $\frac{12}{28}$
- B. $\frac{13}{35}$
- C. $\frac{18}{35}$
- D. $\frac{24}{35}$

Ans. C

Ques 8. $\int_0^{\frac{\pi}{3}} \cos^4 x dx$ is equal to $a\pi + b\sqrt{3}$, then $a^2 + b$ is equal to:

- A. $\frac{1}{2}$
- B. $\frac{1}{8}$
- C. $\frac{1}{4}$
- D. 1

Ans. B

Ques 9. Let m and n be the coefficient of 7th and 13th term in expansion of $(\frac{1}{3}x^{1/3} + \frac{1}{2}x^{2/5})^{18}$, then $(m/n)^{1/3}$ is:

- A. $\frac{1}{4}$
- B. $\frac{4}{7}$

- C. 1/9
- D. 4/9

Ans. D

$$\left| z + \frac{3+4i}{2} \right|$$

Ques 10. The minimum value of $\left| z + \frac{3+4i}{2} \right|$, $|z| \leq 1$ is,

- A. 3/2
- B. 5/2
- C. 3
- D. 5

Ans. A

Ques 11. Let vertex A(2, 3, 1), B(3, 2, -1), C(-2, 1, 3). If AD is angle bisector of angle A, then projection of \vec{AD} on \vec{AC} is equal to:

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

Ans. B

Ques 12. $dy/dx = (1-x-y^2)/y$ and $x(1)=1$, then $5x(2)$ is equal to_____.

Ans. 5

Ques 13. There are 20 lines numbered as 1,2,3,..., 20. And the odd numbered lines intersect at a point and all the even numbered lines are parallel. Find the maximum number of point of intersections

Ans. 101

Ques 14. Let $a_1, a_2, a_3, \dots, a_n$ be in A. P. and S_n denotes the sum of first n terms of this A. P. is $S_{10} = 390$, $a_{10}/a_{50} = 15/7$, then $S_{15} - S_5 =$ _____.

Ans. 365