

MET 2022 Memory Based Question Paper PDF

Physics

1. The time period of a mass suspended from a spring is T . If the spring is cut into three equal parts and connected in parallel. The same mass is suspended from these parallel springs, then the new time period of the mass will be

- A. $T/4$
- B. T
- C. $T/3$
- D. $3T$

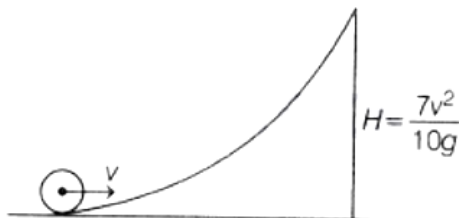
2. The work done by all the forces (external and internal) on a system is equal to change in

- A. total energy
- B. kinetic energy
- C. potential energy
- D. None of these

3. A wire in the form of semi-circle of radius r rotates about its diameter with angular velocity ω in a magnetic field B . The axis of rotation is perpendicular to the field. The total resistance of the circuit is R . If the mean power generated per period of rotation is $\frac{(B\pi r^2(\omega))^2}{xR}$, then the value of x is

Numerical

4. A small object of uniform density rolls up a curved surface with an initial velocity v . It reaches upto a maximum height of $7v^2/10g$ with respect to initial position. Then the object is



- A. ring
- B. solid sphere
- C. hollow sphere
- D. disc

5. If the radius of a planet is three times the radius of the earth. Both have same mass-densities. v_P and v_E are the escape velocities of the planet and the earth respectively, then

- A. $v_P = 1.5v_E$
- B. $v_P = 3v_E$
- C. $v_E = 2v_P$
- D. $v_P = 2v_E$

6. The stress that has to be applied to the ends of a steel wire of length 20 cm to keep its length constant, when its temperature is raised by 100°C is $2.2 \times 10^x \text{ Pa}$. The value of x is

(Given $Y = 2 \times 10^{11} \text{ Nm}^{-2}$,
 $\alpha = 1.1 \times 10^{-5} \text{ C}^{-1}$)

Numerical

7. A vessel contains oil (Density = 0.8 g/cm^3) over mercury (density = 13.6 g/cm^3). A homogeneous sphere floats with half of its volume immersed in mercury and the other half in oil. The density of the material of the sphere is $x \text{ g/cm}^3$. The value of x is

Numerical

8. At which temperature, magnitude of $^\circ\text{C}$ and $^\circ\text{F}$ are equal?

- A. 273
- B. 40
- C. -40
- D. -273

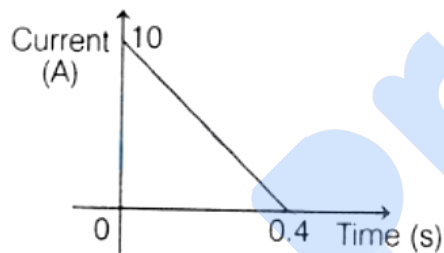
9. The potential at a point at a distance r from the centre of an electric dipole is proportional to

- A. $1/r$
- B. $1/r^2$
- C. $1/r^3$
- D. r^2

10. The electric resistance of a wire is R . If the length of the wire is increased to doubled by stretching it, then the new resistance of the wire is

- A. $2R$
- B. $4R$
- C. R
- D. $16R$

11. In a coil of resistance 150Ω , a current is induced by changing the magnetic flux through it as shown by figure. The magnitude of flux through the coil is Wb.



Numerical

12. A particle of charge q and mass m is moving with a velocity $-2v\hat{i}$ ($v \neq 0$) towards a large screen placed in $Y Z$ -plane placed at a distance d . If there is a magnetic field $B = B_0\hat{k}$, the maximum value of v for which the particle will not strike the screen is

- A. $\frac{qdB_0}{m}$
- B. $\frac{qdB_0}{2m}$
- C. $\frac{2qqdB_0}{m}$

D. $\frac{qdB_0}{3m}$

13. The angle of a prism is A. One of its refracting surface is silvered. If light rays: falling at an angle of incidence 2A on the first surface returns back through the same path after reflection from silvered surface. The refractive index μ of the prism is

- A. $2\sin A$
- B. $2\cos A$
- C. $1/2\cos A$
- D. $\tan A$

14. An electron, helium ion (He^{++}) and proton having the same kinetic energy. The relation between their respective de-Broglie wavelengths λ_e , $\lambda_{\text{He}^{++}}$ and λ_p is

- A. $\lambda_e > \lambda_p > \lambda_{\text{He}^{++}}$
- B. $\lambda_e > \lambda_{\text{He}^{++}} > \lambda_p$
- C. $\lambda_e < \lambda_p < \lambda_{\text{He}^{++}}$
- D. $\lambda_e < \lambda_{\text{He}^{++}} = \lambda_p$

15. The electric field of light wave is given is

$$E = 10^3 \cos\left(\frac{2\pi x}{5 \times 10^{-7}} - 2\pi \times 6 \times 10^{14} t\right) \hat{j} \text{ N/C}.$$

This light falls on a metal plate of work function 1.5 eV. The stopping potential of the photoelectron is V.

(Energy of photon = $\frac{1240}{\lambda(\text{in nm})} \text{ eV}$).

Numerical

Chemistry

1. Arrange the following in increasing order of the volume (in L) occupied by them at STP

- (i) 1.5 moles of CO_2
- (ii) 14 g of N_2
- (iii) 10^{21} molecules of oxygen

- A. (iii) < (ii) < (i)
- B. (i) < (ii) < (iii)
- C. (ii) < (i) < (iii)
- D. (i) < (iii) < (ii)

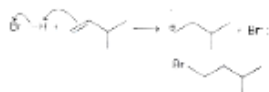
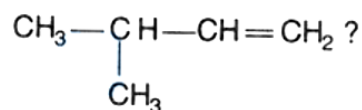
2. According to VSEPR theory, the molecular shapes of XeF_4 , XeO_4 , XeO_2F_2 and XeOF_4 respectively are

- A. square planar, square planar, see-saw, square pyramidal.
- B. square planar, tetrahedral, trigonal bipyramidal, octahedral.
- C. square planar, tetrahedral, see-saw, square pyramidal.
- D. octahedral, tetrahedral, trigonal bipyramidal, octahedral.

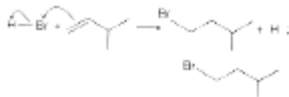
3. If gas absorbs 150 J of heat and expands by 450 cm^3 against a constant pressure of $2 \times 10^5 \text{ Nm}^{-2}$, then change in internal energy is

- A. -60 J
- B. 60 J
- C. 240 J
- D. -240 J

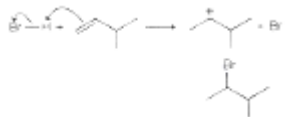
4. What is the first step and the final product formed in the reaction of H – Br with



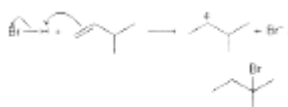
A.



B.



C.



D.

5. In case of positive deviation from Raoult's law, the intermolecular attractive forces between the solute-solvent molecules as compared to those between the solute-solute and solvent-solvent molecules are

A. weaker

B. stronger

C. same

D. independent of intermolecular forces between solute-solvent molecules.

6. From the following molar conductivities at infinite dilution, Λ_m° (in $\Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$) for NH_4OH is

$$\Lambda_m^\circ \text{ for } \text{Ba}(\text{OH})_2 = 446.8 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

$$\Lambda_m^\circ \text{ for } \text{BaCl}_2 = 241.6 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

$$\Lambda_m^\circ \text{ for } \text{NH}_4\text{Cl} = 130 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

Numerical

7. For the reaction, $\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g})$ the value of the rate of disappearance of N_2O_5 is given as $5.15 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$. The rate of formation of NO_2 is.

Numerical

8. Mond's process is used for refining ____ Whereas van Arkel method is used for refining ____.

A. lead, zirconium

B. zirconium, nickel

C. nickel, lead

D. nickel, titanium

9. Out of N, P, Ar, Sb and Bi, the number of elements that form pentahalides are

Numerical

10. The number of oxygen atoms that are directly attached to one chromium in dichromate ion are

Numerical

11. Select the correct statement.

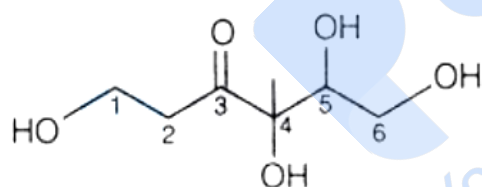
A. $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic whereas $[\text{Ni}(\text{CO})_4]$ is paramagnetic.

B. $[\text{Ni}(\text{CN})_4]^{2-}$ and $[\text{Ni}(\text{CO})_4]$ both are diamagnetic.

C. $[\text{Ni}(\text{CN})_4]^{2-}$ is sp^3 hybridised and square planar in shape whereas $[\text{Ni}(\text{CO})_4]$ is dsp^2 hybridised and tetrahedral in shape.

D. $[\text{Ni}(\text{CN})_4]^{2-}$ is paramagnetic and dsp^2 hybridised whereas $[\text{Ni}(\text{CO})_4]$ is diamagnetic and sp^3 hybridised.

12. Alcoholic group of which position in the given molecule reacts fastest with the Lucas' reagent?



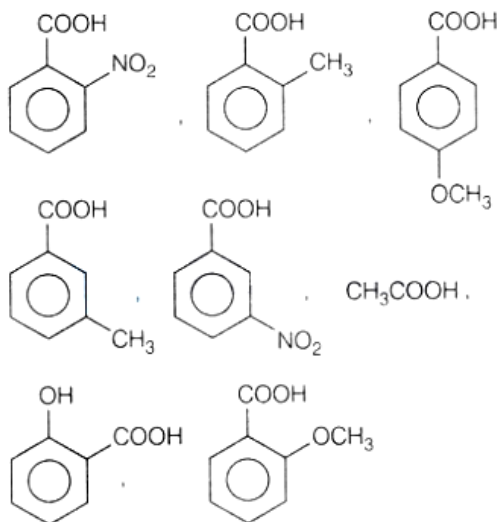
A. 1

B. 4

C. 5

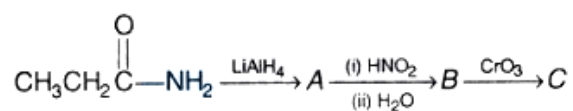
D. 6

13. Out of the given compounds, the number of compounds are weaker acids than benzoic acid are



Numerical

14. In the following sequence of reactions, the compound C formed would be



A. 2-propanol

B. propanol

C. propanoic acid

D. propanal

15. Polystyrene is a ____ polymer whereas dacron is a ____ polymer.

A. step growth, chain growth

B. chain growth, step growth

C. condensation, addition

D. thermoplastic, thermosetting

Mathematics

1. If $|z + \frac{2}{z}| = 2$, then the minimum value of $|z|$ is

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

2. The number of 4 letter word (with or without meaning) that can be formed from the eleven letters of the word 'EXAMINATION is

Numerical

3. If α, β and γ are in AP and $\tan^{-1} \alpha, \tan^{-1} \beta$ and $\tan^{-1} \gamma$ are also in AP, then

- A. $\alpha - \beta - \gamma = 0$
- B. $\alpha = \beta = \gamma$
- C. $\alpha + \beta = \gamma$
- D. $2\alpha = 3\beta = \gamma$

4. The coefficient of the middle term in the binomial expansion in powers of x of $(1 + \alpha x)^4$ and $(1 - \alpha x)^6$ is the same, if α is equal to

- A. $-5/3$
- B. $10/3$
- C. $-3/10$
- D. $3/5$

5. The differential equation of all circles passing through the origin and having their centre on the X-axis is

- A. $x^2 = y^2 + xy \frac{dy}{dx}$
- B. $x^2 = y^2 + 3xy \frac{dy}{dx}$
- C. $y^2 = x^2 + 2xy \frac{dy}{dx}$
- D. $y^2 = x^2 - 2xy \frac{dy}{dx}$

6. The value of $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \sec^2 t dt}{x \sin x}$ is

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

7. $\lim_{x \rightarrow 2} \frac{x^3 + 2^3 - x - 5}{2^{-x/2} - 2^{1-x}}$ is equal to _____

Numerical

8. If $\sum_{i=1}^{10} (x_i - 3) = 7$ and $\sum_{i=1}^{10} (x_i - 3)^2 = 27$, then the standard deviation of the 10 items

- A. 2.547
- B. 1.87
- C. 14.86
- D. 1.486

9. If $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$, then state which of the following is true?

- A. $(A \times C) \subset (B \times D)$
- B. $A \times B \subset C \times D$
- C. $(A \times B) \subset (A \times D)$
- D. $A \times C \subset B \times D$

10. If A and $n \times n$ non-singular matrix such that $AA^T = A^{-1}A$ and $B = A^{-1}A^T$, then BB' is equal to

- A. $1 + B$
- B. 1
- C. B^{-1}
- D. $(B^{-1})'$

11. Let $f(x) = \sqrt{1 + x^2}$, then

- A. $f(xy) = f(x) \cdot f(y)$

B. $f(xy) \geq f(x) \cdot f(y)$

C. $f(x,y) \leq f(x) \cdot f(y)$

D. $f(xy) = f(x) - f(y)$

12. For what value of θ lying between 0 and π which satisfy inequality $\sin\theta \cos^3 \theta > \sin^3 \theta \cos\theta$

A. $\theta \in (\pi/4, \pi/2)$

B. $\theta \in (0, \pi/4)$

C. $\theta \in (0, \pi/2)$

D. None of these

13. If $\int f(x)dx = g(x)$, then $\int x^9 \cdot f(x^5) dx$ is equal to

A. $1/5 (x^5 g(x^9) - 4 \int g(x)dx + C$

B. $1/5 [x^9 g(x^5) - 1/5 \int x^4 g(x^5) dx + C$

C. $1/5 [g(x^9) + \int g(x^5) dx]$

D. $\frac{x^5}{5} g(x^5) - \int x^4 g(x^5) dx + C$

14. The area of the region bounded by the curves $y = |x - 2|$, $x = 1$, $x = 3$ and the x-axis is

A. 1 sq unit

B. 2 sq units

C. 3 sq units

D. 4 sq units

15. The area of the region described by $A = \{(x, y) : x^2 + y^2 \leq 1 \text{ and } y^2 \leq 1 - x\}$ is

A. $\pi/2 + 4/3$

B. $\pi/2 - 1/2$

C. $\pi/4 + 2/3$

D. $\pi/2 + 2/3$

If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and vectors $(1, a, a^2)$, $(1, b, b^2)$ and $(1, c, c^2)$ are non-coplanar, then the

16. product abc is _____

Numerical

17. If the lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{2k} = \frac{y-3}{2} = \frac{z-5}{1}$ are coplanar, then k can have

- A. exactly one value, $k = 1/2$
- B. exactly one value, $k = 1/4$
- C. exactly two values, $k = 1/2, -3/2$
- D. any value

18. If the foot of the perpendicular drawn from the point $(0, 2, 1)$ on a line passing through $(\alpha, 5, 1)$ is $(5/3, 7/3, 15/i)$, then α is equal to _____

Numerical

19. A multiple choice examination has 5 questions. Each question has 4 alternative answer of which exactly one is correct. The probability that a student will get 4 or more correct answer just by guessing is

- A. $1/4^5$
- B. $(3/4)^4$
- C. $1/4^3$
- D. $3/4^5$

20. If the probability that a randomly chosen 6-digit number formed by using digits 1 and 8 only is a multiple of 21 is p , then $96p$ is equal to

Numerical