

MHT CET 2020 Mathematics Memory Based Question Paper PDF

SECTION: PHYSICS

1. Two springs of equal length and equal area of cross-section are suspended from rigid support and loaded with same mass. Young's modulus of two springs is in the ratio 4 : 3. When the springs are stretched through some distance and released, they will oscillate with periods T_1 and T_2 . The ratio $T_1 : T_2$ is:
 - 1) $2 : \sqrt{3}$
 - 2) $3 : 4$
 - 3) $4 : 3$
 - 4) $\sqrt{3} : 2$
2. Rate of radiation by a black body is 'R' at temperature 'T'. Another body has same area but emissivity is 0.2 and temperature '3T'. Its rate of radiation is:
 - 1) $(8.1)R$
 - 2) **$(16.2)R$**
 - 3) $(24.3)R$
 - 4) $(32.4)R$
3. In an LCR circuit, inductive reactance is 30Ω and capacitive reactance 30Ω . The resistance was found to be 40Ω . The probable impedance of the combination is:
 - 1) 60Ω
 - 2) 20Ω
 - 3) 100Ω
 - 4) **40Ω**
4. A metal surface is irradiated by radiations whose wavelength is ' λ '. If the work function of the metal surface is negligibly small, then the de-Broglie wavelength of emitted electrons will be:
[c = velocity of light, m = mass of electron, h = Planck's constant]
 - 1) $\left[\frac{h\lambda}{2mc}\right]^{1/2}$
 - 2) $\left[\frac{h\lambda}{2mc}\right]^{1/3}$
 - 3) $\left[\frac{2hc}{\lambda}\right]^{1/2}$
 - 4) $\left[\frac{hc}{2m\lambda}\right]^{1/3}$
5. In a transistor, doping level in base is increased slightly, the collector current and base current respectively:

- 1) increases slightly, decreases slightly.
 - 2) **decreases slightly, increases slightly.**
 - 3) increases slightly, increases slightly.
 - 4) decreases slightly, decreases slightly.
6. When an unknown resistance 'X' is connected in the left gap of a meter bridge and a known resistance 'R' in the right gap, null point is obtained at 40 cm from left end. If a 2Ω resistance is connected in series with 'X' the null point shifts towards right by 10 cm, with same resistance in right gap. The value of 'X' must be:
- 1) 1Ω
 - 2) **4Ω**
 - 3) 2Ω
 - 4) 3Ω
7. A bullet of mass 20 gram is fired from a gun of mass 2.5 kg with a speed of 750 m/s. The magnitude of recoil velocity of the gun is:
- 1) 12 m/s
 - 2) 3 m/s
 - 3) **6 m/s**
 - 4) 18 m/s
8. Logic circuit shows the inputs A, B and C. The output Y is '0' (zero) when:
- 1) $A = 1, B = 0, C = 1$
 - 2) $A = 1, B = 1, C = 0$
 - 3) **$A = 1, B = 1, C = 1$**
 - 4) $A = 0, B = 1, C = 1$
9. Imagine two bar magnets having same magnetic dipole moment 'M', are inclined with each other as shown in figure. Their resultant magnetic moment will be:
[$\cos 120^\circ = -1/2, \cos 60^\circ = 1/2$]
- 1) $M/2$
 - 2) **M**
 - 3) $\sqrt{2}M$
 - 4) $\sqrt{3}M$
10. A stationary sound wave has a frequency of 165 Hz. If the speed of sound in air is 330 m/s, then the distance between a node and the adjacent antinode is:
- 1) 80 cm
 - 2) **50 cm**
 - 3) 2 cm
 - 4) 20 cm

11. A particle is performing vertical circular motion. The difference in tension at lowest and highest point is:
- 1) $2\,mg$
 - 2) **$6\,mg$**
 - 3) $8\,mg$
 - 4) $4\,mg$
12. The relative magnetic permeability (μ_r) of a substance is related to its susceptibility (χ) as:
- 1) $\mu_r = 1 - \chi^2$
 - 2) $\mu_r = 1 + \chi^2$
 - 3) $\mu_r = 1 + \chi$
 - 4) $\mu_r = 1 - \chi$
13. A spring produces extension 'x' by applying a force 'F' N. A body of mass 'm' suspended from spring oscillates vertically with a period 'T'. The mass of the suspended body is: (neglect mass of spring)
- 1) $\frac{2T^2 F}{\pi^2 x}$
 - 2) **$\frac{T^2 F}{4\pi^2 x}$**
 - 3) $\frac{T^2 F}{\pi^2 x}$
 - 4) $\frac{T^2 F}{2\pi^2 x}$
14. A galvanometer having a resistance of $18\,\Omega$ is shunted by a wire of resistance $2\,\Omega$. If the total current passing through the combination is $2\,A$, then current through shunt will be:
- 1) **$1.8\,A$**
 - 2) $0.9\,A$
 - 3) $12\,A$
 - 4) $12.2\,A$
15. The magnetic field developed due to current carrying coil at its centre is 'B'. If a new coil of two turns is prepared from the above coil and same current is passed, then the magnetic field at the centre of the new coil will be:
- 1) $B/2$
 - 2) **$4\,B$**
 - 3) $B/4$
 - 4) $2B$
16. When a light ray is incident on a prism at an angle of 45° , the minimum deviation is obtained. If refractive index of material of prism is $\sqrt{2}$, then angle of prism will be:
- 1) 30°
 - 2) **75°**

- 3) 45°
4) **60°**
17. The moduli of elasticity for a substance are Young's modulus, Bulk modulus and Modulus of rigidity. All the three moduli of elasticity are possessed by:
- 1) gases and liquids.
2) solids and liquids.
3) **solids only.**
4) solids and gases.
18. A light of wavelength ' λ ' and intensity ' I ' falls on photosensitive material. If ' N ' photoelectrons are emitted, each with kinetic energy E , then:
- 1) **$E \propto 1/\lambda, N \propto I$**
2) $E \propto I, N \propto I$
3) $E \propto I, N \propto 1/\lambda$
4) $E \propto I, N \propto \lambda$
19. A mass M moving with velocity v along x axis collides and sticks to another mass $2M$ which is moving along Y axis with velocity $3v$. After collision, the velocity of the combination is:
- 1) $\frac{v}{3}\hat{i} - 2v\hat{j}$
2) $\frac{2v}{3}\hat{i} + \hat{j}$
3) $v\hat{i} + \frac{v}{3}\hat{j}$
4) **$\frac{v}{3}\hat{i} + 2v\hat{j}$**
20. A resonance tube closed at one end is of height 1.5 m . A tuning fork of frequency 340 Hz is vibrating above the tube. Water is poured in the tube gradually. The minimum height of water for which resonance is obtained is:
(Neglect end correction. Speed of sound in air = 340 m/s)
- 1) 5 cm
2) 125 cm
3) 150 cm
4) **25 cm**
21. Figure shows triangular lamina PQR (right angled at Q) which can rotate about different axis of rotation. Moment of inertia is maximum about the axis:
- 1) QS
2) **QR**
3) PQ
4) PR
22. In the case of earth, mean radius is ' R ', acceleration due to gravity on the surface is ' g ', angular speed about its own axis is ' ω '. What will be the radius of the orbit of a geostationary satellite?

- 1) $\left[\frac{\omega^2}{gR^2} \right]^{1/2}$
 - 2) $\left[\frac{gR^2}{\omega^2} \right]^{1/3}$
 - 3) $\left[\frac{gR^2}{\omega^2} \right]^{1/2}$
 - 4) $\left[\frac{\omega^2}{gR^2} \right]^{1/3}$
23. For a certain organ pipe, three successive resonant frequencies are heard as 300 Hz, 420 Hz and 540 Hz. If the speed of sound in air is 360 m/s, then the pipe is a:
- 1) open pipe of 1.5 m length.
 - 2) open pipe of 3 m length.
 - 3) closed pipe of 3 m length.
 - 4) **closed pipe of 1.5 m length.**
24. When a certain metallic surface is illuminated with monochromatic light of wavelength ' λ ', the stopping potential for photoelectric effect is ' $3V_0$ '. If the same surface is illuminated with a light of wavelength ' 2λ ', the stopping potential is found as V_0 . The threshold wavelength for this surface is:
- 1) $\lambda/4$
 - 2) **4λ**
 - 3) 6λ
 - 4) $\lambda/6$
25. Which one of following statements about the angle of contact (θ), is wrong?
- 1) **θ is not constant for particular solid – liquid pair.**
 - 2) $\theta > 0^\circ$ for pure water - glass pair.
 - 3) $\theta > 90^\circ$ for mercury - glass pair.
 - 4) $\theta < 90^\circ$ for kerosene - glass pair.
26. A plane surface area 200 cm^2 is kept in a uniform electric field of intensity 200 N/C . If the angle between the normal to the surface and the field is 60° , then the electric flux through the surface is:
- 1) $4 \text{ Nm}^2/\text{C}$
 - 2) $100 \text{ Nm}^2/\text{C}$
 - 3) **$2 \text{ Nm}^2/\text{C}$**
 - 4) $200 \text{ Nm}^2/\text{C}$
27. The frequency of a tuning fork is 220 Hz and the velocity of sound in air is 330 m/s. When the tuning fork completes 80 vibrations, the distance travelled by the wave is:
- 1) 100 m
 - 2) 60 m

- 3) 53 m
4) **120 m**
28. What is the least radius of curve on a horizontal road, at which a vehicle can travel with a speed of 36 km/hr at an angle of inclination 45° ?
[$g = 10 \text{ m/s}^2$, $\tan 45^\circ = 1$]
- 1) **10 m**
2) 20 m
3) 25 m
4) 15 m
29. Forces $\vec{P}$ and $\vec{Q}$ have resultant $\vec{R}$ whose magnitude is 40 N . $\vec{R}$ makes an angle 45° with $\vec{P}$ as well as $\vec{Q}$. The magnitude of $\vec{P}$ is:
- 1) $20\sqrt{5} \text{ N}$
2) $\sqrt{20} \text{ N}$
3) **$20\sqrt{2} \text{ N}$**
4) 20 N
30. There are three needles ' N_1 ', ' N_2 ' and ' N_3 ' made of a ferromagnetic, a paramagnetic and a diamagnetic substance respectively. When a magnet is brought close to them, then it will:
- 1) attract N_2 strongly, N_1 and N_3 weakly.
2) attract N_1 strongly, repel N_2 and N_3 weakly.
3) attract N_1 strongly, N_2 and N_3 weakly.
4) **attract N_1 strongly and N_2 weakly, repel N_3 weakly.**
31. Time taken by sunlight to penetrate 2 mm through a glass slab is of the order:
Refractive index of glass = 1.5, velocity of light in air = $3 \times 10^8 \text{ m/s}$
- 1) 10^{-19} s
2) **10^{-11} s**
3) 10^5 s
4) 10^{-10} s
32. A block of mass 1 kg is kept on ice surface. When velocity of 4 m/s is given to it, it stops by friction in 5 second. The coefficient of friction is: [$g = 10 \text{ m/s}^2$]
- 1) 0.06
2) 0.04
3) 0.02
4) **0.08**
33. The resolving power of telescope depends on:
- 1) length of telescope.

- 2) focal length of an objective.
 3) **diameter of the objective.**
 4) focal length of an eye piece.
34. Force $F = P + Qt + \frac{1}{r+xs} + c \sin(\omega t + \phi)$ where x and t represent displacement and time respectively. The dimensions of the product ' cs ' are:
- 1) $[L^1 M^0 T^0]$
 2) $[L^{-1} M^1 T^0]$
 3) $[L^{-1} M^0 T^0]$
 4) $[L^1 M^{-1} T^1]$
35. If a capillary tube is immersed vertically in water, rise of water in capillary is ' h_1 '. When the whole arrangement is taken to a depth ' d ' in a mine, the water level rises to ' h_2 '. The ratio h_1/h_2 is:
 (R = radius of earth)
- 1) $(1 + d^2/R^2)$
 2) $(1 + d/R)$
 3) $(1 - d^2/R^2)$
 4) **$(1 - d/R)$**
36. A radar of power 1 kW operating at frequency 10 GHz is located on a mountain top of height 500 m . The maximum distance upto which it can detect object located on the surface of the earth is:
 [Radius of earth = $6.4 \times 10^6 \text{ m}$]
- 1) 8 km
 2) **80 km**
 3) 70 km
 4) 56 km
37. When lens of refractive index ' μ_1 ' is placed in liquid of refractive index ' μ_2 ', the lens looks to be disappeared only if:
- 1) $2\mu_1 = \mu_2$
 2) $\mu_1 = 2\mu_2/3$
 3) $\mu_1 = \mu_2$
 4) $\mu_1 = 3\mu_2/2$
38. A simple pendulum oscillates with an angular amplitude ' θ '. If the maximum tension in the string is twice the minimum tension, then ' θ ' is:
- 1) $\cos^{-1}(0.25)$
 2) $\cos^{-1}$ (**0.75**)
 3) $\cos^{-1}(0.10)$
 4) $\cos^{-1}(0.50)$

39. The kinetic energy of a particle performing S.H.M. is $1/n$ times its potential energy. If the amplitude of S.H.M. is 'A', then the displacement of the particle will be:

- 1) $\sqrt{\frac{nA^2}{n+1}}$
- 2) A/n
- 3) nA
- 4) $\sqrt{\frac{(n+1)A^2}{n}}$

40. For the weight of body of mass 5 kg to be zero on equator of the earth, angular velocity of the earth must be:

[The radius of earth = 6400 km , $g = 10\text{ m/s}^2$]

- 1) $1/80\text{ rad/s}$
- 2) $1/400\text{ rad/s}$
- 3) **$1/800\text{ rad/s}$**
- 4) $1/1600\text{ rad/s}$

41. The ratio of areas of electron orbits for the second excited state to the first excited state in hydrogen atom, is:

- 1) $4/9$
- 2) $16/81$
- 3) **$81/16$**
- 4) $9/4$

42. A uniform disc of mass 4 kg has radius of 0.4 m . Its moment of inertia about an axis passing through a point on its circumference and perpendicular to its plane is:

- 1) $0.16\text{ kg} \cdot \text{m}^2$
- 2) $0.32\text{ kg} \cdot \text{m}^2$
- 3) $0.64\text{ kg} \cdot \text{m}^2$
- 4) **$0.96\text{ kg} \cdot \text{m}^2$**

43. An electron moves in a circular orbit of radius 'r' with uniform speed 'v'. It produces magnetic field 'B' at the centre of circle. The magnetic field 'B' is proportional to:

- 1) $1/(vr^2)$
- 2) r^2/v
- 3) **v/r^2**
- 4) vr^2

44. S.I. Unit of emissive power of a body at a given temperature is:

- 1) **$\text{J}/(\text{m}^2\text{s})$**
- 2) J/m^2
- 3) J/s

- 4) W/m
45. Two coherent light sources of intensity ratio 'n' are employed in an interference experiment. The ratio of the intensities of the maxima and minima in the interference pattern is ($I_1 > I_2$):
- 1) $(\frac{n+1}{n-1})^2$
 - 2) $(\frac{\sqrt{n+1}}{\sqrt{n-1}})^2$
 - 3) $\frac{\sqrt{n+1}}{\sqrt{n-1}}$
 - 4) $\frac{n+1}{n-1}$
46. For three non-zero vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$, if $\vec{A} + \vec{B} = \vec{C}$ and $A^2 + B^2 = C^2$, then the angle between $\vec{A}$ and $\vec{B}$ will be:
- 1) 90°
 - 2) 180°
 - 3) 30°
 - 4) 60°
47. In potentiometer experiment, the balancing length with cell E_1 of unknown e.m.f. is ℓ_1 cm. By shunting the cell E_1 with resistance 'R' which is equal to internal resistance (r) of the cell E_1 , the balancing length ℓ_2 is:
- 1) ℓ_1
 - 2) $\ell_1/4$
 - 3) $\ell_1/2$
 - 4) $2\ell_1$
48. A capacitor of unknown capacitance is connected across a battery of 'V' volt. The charge stored in it is 'Q' coulomb. When potential across the capacitor is reduced by V' volt, the charge stored in it becomes Q' coulomb. The potential V is:
- 1) $\frac{QV'}{Q+Q'}$
 - 2) $\frac{Q+Q'}{QV'}$
 - 3) $\frac{Q-Q'}{QV'}$
 - 4) $\frac{QV'}{Q-Q'}$
49. Two bodies rotate with kinetic energies E_1 and E_2 . Moment of inertia about their axis of rotation is I_1 and I_2 . If $I_1 = I_2/3$ and $E_1 = 27E_2$, then the ratio of the angular momenta L_1 to L_2 is:
- 1) **3 : 1**
 - 2) 1 : 3
 - 3) 1 : 9
 - 4) 9 : 1

50. A resistance of 100Ω , inductor of self-inductance $(4/\pi^2)$ H and a capacitor of unknown capacitance are connected in series to an a.c. source of $200V$ and 50 Hz . When the current and voltage are in phase, the capacitance and power dissipated is respectively:

- 1) $2.5 \times 10^{-5}\text{ F}$, 400 W
- 2) $1.5 \times 10^{-5}\text{ F}$, 200 W
- 3) $2.0 \times 10^{-5}\text{ F}$, 100 W
- 4) $3.0 \times 10^{-5}\text{ F}$, 50 W

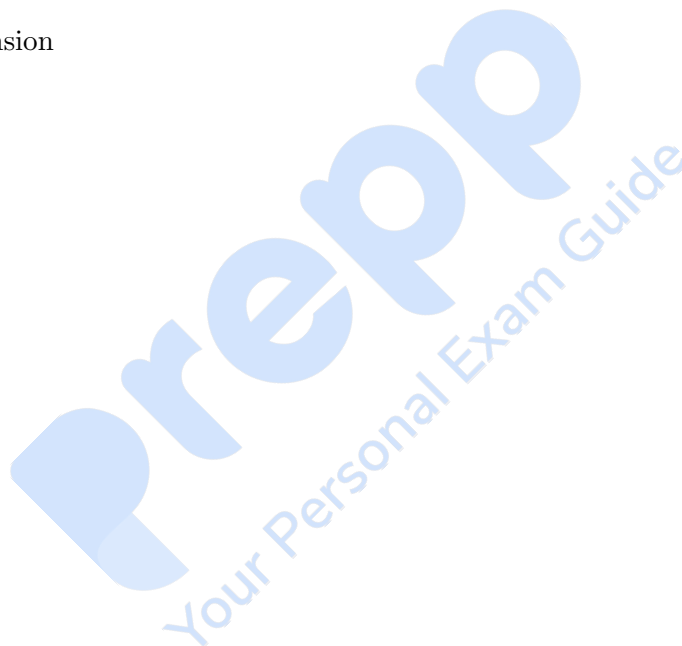


SECTION: CHEMISTRY

1. If ΔH° and ΔS° for the reaction $N_2O_{4(g)} \longrightarrow 2NO_{2(g)}$ are 57.24 kJ and $175.8 \text{ JK}^{-1}\text{mol}^{-1}$ respectively. What is the value of ΔG° for this reaction at 298 K ?
 - 1) 57.24 kJ
 - 2) -17.58 kJ
 - 3) -4.85 kJ
 - 4) **4.85 kJ**
2. Which cation from the following does NOT form a colourless compound?
(Atomic number - $Cu = 29, Ti = 22, Zn = 30, Sc = 21$)
 - 1) Sc^{3+}
 - 2) Cu^{+1}
 - 3) **Ti^{3+}**
 - 4) Zn^{2+}
3. Which of the following properties is NOT a colligative property?
 - 1) Elevation in boiling point.
 - 2) Osmotic pressure.
 - 3) **Vapour pressure of solvent.**
 - 4) Depression in freezing point.
4. Which among the following groups has lowest priority in assigning R, S convention?
 - 1) $-COOH$
 - 2) **$-CONH_2$**
 - 3) $-CH_2 - OH$
 - 4) $-CN$
5. Which of the following set of compounds does NOT demonstrate the law of multiple proportion?
 - 1) **H_2O, CO_2, CH_4**
 - 2) H_2O, H_2O_2
 - 3) SO_2, SO_3
 - 4) NO, NO_2
6. Which of following has intramolecular hydrogen bonding?
 - 1) Ethyl alcohol
 - 2) Ammonia
 - 3) **O – nitrophenol**
 - 4) Hydrofluoric acid

7. Identify the mineral of iron from following:
- 1) Willemite
 - 2) Calamine
 - 3) **Siderite**
 - 4) Magnesite
8. Which among the following is true for the reaction:
 $C_2H_5OH_{(l)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(l)}$
- 1) $\Delta H = \Delta U + 2RT$
 - 2) $\Delta H = \Delta U - 2RT$
 - 3) **$\Delta H = \Delta U - RT$**
 - 4) $\Delta H = \Delta U + RT$
9. van't Hoff factor for $K_3[Fe(CN)_6]$ is 3.333. What is its percentage dissociation in water?
- 1) **77.7%**
 - 2) 70%
 - 3) 83%
 - 4) 58%
10. Which mineral among following contains zinc?
- 1) **Willemite**
 - 2) Corundum
 - 3) Azurite
 - 4) Malachite
11. What is the oxidation state of chlorine atom in chlorous acid?
- 1) **+3**
 - 2) +1
 - 3) +2
 - 4) -1
12. What is the oxidation number of V in $V_2O_7^{4-}$ ion?
- 1) +4
 - 2) +3
 - 3) +6
 - 4) **+5**
13. The number of asymmetric carbon atoms present in 2,3-dichloro-4-methyl pentane is:
- 1) One
 - 2) Three

- 3) **Two**
 - 4) Four
14. Which among the following elements when added to silicon forms P-type semiconductor?
- 1) *Sb*
 - 2) *Bi*
 - 3) **B**
 - 4) *As*
15. Which of the following is an extensive property?
- 1) Specific heat
 - 2) **Volume**
 - 3) Density
 - 4) Surface tension



SECTION: BIOLOGY

1. Self-incompatibility is observed in _____.
 - 1) **Orchids**
 - 2) *Callistemon*
 - 3) *Salvia*
 - 4) *Cestrum*
2. These blood corpuscles are also called polymorphs _____.
 - 1) **Neutrophils**
 - 2) Monocytes
 - 3) Basophils
 - 4) Eosinophils
3. In human beings, how much quantity of semen is contributed by the prostate gland?
 - 1) 60%
 - 2) **30%**
 - 3) 80%
 - 4) 10%
4. The blood pressure will be minimum in the _____.
 - 1) systemic aorta
 - 2) pulmonary artery
 - 3) **renal vein**
 - 4) coronary artery
5. Which fossil of human ancestor had cranial capacity of 1450 c.c.?
 - 1) *Homo erectus erectus*
 - 2) *Homo habilis*
 - 3) **Homo neanderthalensis**
 - 4) *Homo sapiens fossilis*
6. Which one of the following is a non-endospermic seed?
 - 1) **Gram**
 - 2) Maize
 - 3) Castor
 - 4) Sunflower
7. How many chromosomes are usually found in the human secondary oocyte?
 - 1) 22

- 2) 44
3) 46
4) **23**
8. Which one of the following is NOT a vector in genetic engineering?
- 1) Plasmid
2) Lambda phage
3) Cosmid
4) **Mosquito**
9. Prokaryotic organisms belong to kingdom _____.
- 1) Plantae
2) Animalia
3) Protista
4) **Monera**
10. Two consecutive nucleotides of a nucleic acid are linked with _____ bond.
- 1) glycosidic
2) **phospho – di – ester**
3) peptide
4) hydrogen
11. A sudden rise in the level of LH stimulates:
- 1) secretion of estrogen
2) **ovulation**
3) secretion of uterine milk
4) degeneration of uterine endometrium
12. Larger DNA molecule CANNOT be inserted in host bacterial cell by using:
- 1) lambda phage
2) M 13 phage
3) cosmid
4) **plasmid**
13. Both cell organelles namely nucleus and lysosomes are absent in:
- 1) Paramecium
2) R.B.Cs. of camel
3) **mature human R.B.Cs.**
4) vertebrate liver cells

14. In the F_2 generation of a dihybrid cross of homozygous parents, the number of genotypes and phenotypes will be respectively:
- 1) 16 and 9
 - 2) 4 and 9
 - 3) **9 and 4**
 - 4) 9 and 16
15. White coating material called enamel covers _____ of tooth.
- 1) root
 - 2) periodontal ligament
 - 3) central cavity
 - 4) **crown**

