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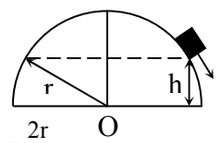
MHT-CET 2007 – Sample Test Paper

Paper 1 – Physics & Chemistry

1. A satellite of mass 'm' revolves around the earth of radius 'R' at a height 'x' from its surface. If 'g' is the acceleration due to gravity on the surface of the earth, the orbital speed of the satellite is :

(A) gx (B) $\frac{gR}{R-x}$ (C) $\frac{gR^2}{R+x}$ (D) $\left(\frac{gR^2}{R+x}\right)^{1/2}$

2. A particle rests on the top of a hemisphere of radius 'r'. It begins to slide without friction as shown in figure. If it leaves the surface of hemisphere at height 'h' above the centre (O) of hemisphere, then :



(A) $h = r$ (B) $h = \frac{r}{3}$ (C) $h = 2r$ (D) $h = \frac{2r}{3}$

3. The surface tension of a liquid is $5\ Nm^{-1}$. If a thin film is formed on a loop of area $0.04\ m^2$, then its surface energy will be

(A) $5\times10^{-2}\ J$ (B) $4\times10^{-1}\ J$ (C) $2\times10^{-1}\ J$ (D) $3\times10^{-1}\ J$

4. According to Prevost's theory every object

(A) radiates heat at the temperature above room temperature
(B) absorbs heat at the temperature above room temperature
(C) radiates heat at all temperatures
(D) reflects radiant heat at all temperatures

5. When interference pattern is obtained the distance between the mid point of the 6^{th} dark band on one side and 4^{th} bright band on the other side of the central bright band is

(A) 2 times the band width (B) 10.5 times the band width
(C) 9.5 times the band width (D) 10 times the band width

6. The internal resistance of lead acid cell is less than the internal resistance of

(A) Daniell cell (B) Leclanche cell (C) dry cell (D) all of these

7. A resistance of 2 Ω is connected in parallel to a galvanometer of resistance 48 Ω. The fraction of the total current passing through the resistance of 2 Ω is

(A) 92% (B) 94% (C) 96% (D) 98%

8. A coil and a bar magnet move in the same direction with same high speed then

(A) high emf is induced across the coil
(B) no emf is induced across the coil
(C) low emf is induced across the coil
(D) magnetic flux linked with the coil changes fast

9. Plate characteristics of a triode valve are the curves obtained on plotting a graph between

(A) plate voltage and plate current at constant grid voltage
(B) grid voltage and plate current at constant plate voltage
(C) grid voltage and plate voltage at constant plate current
(D) filament current and plate current at constant plate voltage

10. To use a transistor as an amplifier

(A) emitter–base junction is forward biased and collector–base junction is reverse biased
(B) both junctions are forward biased
(C) both junctions are reverse biased
(D) it does not matter how the transistor is biased, it always works as an amplifier

11. A radioisotope having $t_{1/2} = 2.3$ days was received after 9.2 days. It was found that 300 mg of the isotope was left in the container. The initial amount of the isotope was
(A) 4800 mg (B) 2400 mg (C) 1200 mg (D) 3600 mg

12. Among the third row elements, silicon has the highest
(A) Melting point (B) Electronegativity (C) Electron affinity (D) Electropositivity

13. The pair of molecules having same hybridisation of central atom is
(A) NH_3, H_2O (B) BF_3, CO_2 (C) CH_4, BF_3 (D) C_2H_2, C_2H_4

14. The elements A and B have the following electronic configurations A = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$ and B = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$.
The expected compound formed by the combination of A and B is
(A) AB_2 (B) A_5B_2 (C) A_2B_5 (D) AB_5

15. The solubility product of barium chromate is 2.4×10^{-10}. The maximum concentration of barium nitrate possible without precipitation in a solution of 6×10^{-4} M K_2CrO_4 is
(A) 4×10^{-7} M (B) 1.2×10^{-10} M (C) 6×10^{-4} M (D) 3×10^{-4} M

16. An acid is 40% dissociated in an aqueous solution. The hydronium ion concentration of its 0.2M solution would be
(A) 0.08 M (B) 0.4 M (C) 0.2 M (D) 0.5 M

17. Which of the following compounds will not give a yellow precipitate with iodine and alkali?
(A) Ethanal (B) Ethanol (C) 1–propanol (D) 2–propanol

18. One of the products of the reaction between concentrated sodium hydroxide and benzaldehyde is
(A) benzyl alcohol (B) Hydrobenzamide (C) Cinnamic acid (D) Benzophenone

19. On strong heating, ammonium acetate gives
(A) Acetamide (B) Methylcyanide (C) Urea (D) Formamide

20. Identify Y in the following sequence.

$$CH_3CHO + CH_3MgI \xrightarrow[\text{Ether}]{} X \xrightarrow[H^+/H_2O]{} Y$$

(A) CH_3OH (B) CH_3CH_2OH (C) $(CH_3)_2CHOH$ (D) $(CH_3)_3COH$

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Paper 2 – Mathematics

1. The value of $\lim_{x\to 0}\frac{e^x - 1 - x}{x^2}$ is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) does not exist (D) none of these

2. If $f'(3) = 5$, then $\lim_{h\to 0}\frac{f(3+h^2) - f(3-h^2)}{h^2}$ is

(A) 5 (B) 10 (C) $\frac{1}{5}$ (D) 2

3. The smallest value of the polynomial $x^3 - 18x^2 + 96x$ in the interval [0, 9] is

(A) 0 (B) 126 (C) 135. (D) 160.

4. The equation of the circle passing through (1, 0) and (0, 1) and having smallest possible radius is

(A) $x^2 + y^2 - x - y = 0$ (B) $x^2 + y^2 + x + y = 0$

(C) $x^2 + y^2 - 2x - y = 0$ (D) $x^2 + y^2 - x - 2y = 0$

5. The eccentric angle of a point on the ellipse $\frac{x^2}{6} + \frac{y^2}{2} = 1$ whose distance from the centre of the ellipse is 2, is

(A) $\pi/4$ (B) $3\pi/2$ (C) $5\pi/3$ (D) $7\pi/6$.

6. $\int e^{e^{e^x}}\, e^{e^x}\, e^x\, dx$ is equal to :

(A) $\frac{1}{2}e^{e^{e^x}} + c$ (B) $e^{e^{e^x}} + c$ (C) $\frac{1}{2}e^{e^x} + c$ (D) $\left(e^{e^{e^x}}\right)^2 + c$

7. If A and B be two invertible matrices of order 3 each, then $(AB)^{-1}$ is equal to

(A) $A^{-1}B^{-1}$ (B) $B^{-1}A^{-1}$ (C) $A^{-1}B$ (D) AB^{-1}

8. A family has 4 children. A child is selected at random from the family. Assuming that there are equal number of boys and girls in the family, the probability that the selected child is a girl, is

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$

9. The real root of $f(x) = 0$ by Regula Falsi method (two iterations only) when $f(x) = x^3 - x - 1$ in [1, 2] is

(A) 1.2351 (B) 1.2531 (C) 1.3071 (D) 1.3071

10. The vector $\frac{1}{8}\hat{i} - \frac{3}{8}\hat{j} + \frac{1}{4}\hat{k}$ is

(A) unit vector (B) parallel to the vector $2\hat{i} - 6\hat{j} + 4\hat{k}$

(C) perpendicular to the vector $2\hat{i} + \hat{j} + \hat{k}$ (D) makes an angle $\frac{\pi}{3}$ with $2\hat{i} - 4\hat{j} + 3\hat{k}$

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