Sample Question Physics, Chemistry, Mathematics and Biology

PHYSICS

1. The capacitance of two concentric spheres of radii R_1 and R_2 is $(R_2 > R_1)$

A) $4\pi \in_0 \frac{R_1 R_2}{R_2 - R_1}$ B) $4\pi \in_0 R_1$ C) $4\pi \in_0 R_2$ D) $4\pi \in_0 \frac{(R_2 - R_1)}{R_1 R_2}$

2. A magnet of length 10 cm and magnetic moment 1 Am^2, is placed along the side AB of an equilateral triangle ABC. If the length of side AB is 10 cm, the magnetic field at point C is

A) 10^{-9} T B) 10^{-4} T C) 10^{-5} T D) 10^{-7} T

3. In an inductor, the current I (in Ampere) varies with time t (in second) as I = 5 + 16 t. If the emf induced in the inductor is 10 mV, then its self inductance is

A) 6.25 X 10^{-4} H B) 6.25 X 10^{-3} H C) 7.5 X 10^{-4} H D) 7.5 X 10^{-3} H

4. The fringe width obtained in Youngs double – slit experiment conducted in a medium of refractive index 3 is 2 mm. The fringe width in vacuum is

A) 5 mm B) 1.5 mm C) 6 mm D) 1 mm

5. Three equal charges $+Q$ each are placed on the vertices of an equilateral triangle. A charge $+q$ is initially placed at the centre of the triangle. If this charge $(+q)$ is slightly displaced towards a vertex and left free, the charge will

A) continue moving towards the corresponding vertex

B) move away from the corresponding vertex

C) return back to the centre

D) oscillate about the centre

6. Three capacitors of capacitances 2mF, 4mF and X mF are connected in series. If the resultant capacitance is 12/11 mF, what is the value of X ?

A) 6 mF B) 8 mF C) 5 mF D) 4 mF

7. Two electron beams having velocities in the ratio of 1:2 are separately subjected to regions of magnetic field strength in the ratio of 1:2, respectively. The ratio of the radii of the circular paths they will traverse will be

A) 1:4 B) 4:1 C) 1:2 D) 1:1

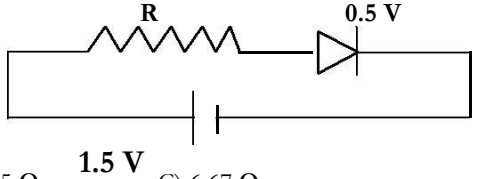
8. An ideal transformer with a step up ratio of 100 operates with an input voltage of 230 V and current of 5 A. The output current at the secondary will be

A) 0.05 A B) 0.5 A C) 0.005 A D) 500 A

9. The ratio of the ionization energy of Bohr's hydrogen atom and hydrogen like Lithium atom is

A) 1:1 B) 1:3 C) 1:9 D) 9:1

10. The diode used in the circuit shown in the figure has a constant voltage drop of 0.5 V at all currents and a maximum power rating of 100 mW. What should be the value of the resistor R connected in series with the diode for obtaining maximum current



A) 1.5 Ω B) 5 Ω C) 6.67 Ω D) 200 Ω

CHEMISTRY

1. Which of the following product is formed in the reaction

$CH_3MgBr \xrightarrow{\text{Dry Ice / acid}} ?$

A) CH_3COOH B) CH_4 C) CH_3OH D) CH_3CH_2CHO

2. The ground state electronic configuration of an element of atomic number 47 is

A) [Kr] $4d^9 5s^2$ B) [Xe] $4d^{10}\ 5s^1$ C) [Kr] $4d^{10}\ 5s^1$ D) [Kr] $4d^6\ 5s^2\ 5p^3$

3. The colour of the precipitate forms when $AgNO_3$ solution reacts with S^{2-} ion

A) red B) black C) white D) yellow

4. Which of the following is an effective reducing agent?

A) H_2O B) H_2S C) H_2Te D) H_2Se

5. The IUPAC name of $[CuCl_2\{O=C(NH_2)_2\}_2]$ is

A) dichloridobis(urea)copper(II) B) bis(urea)dichloridocopper(II)

C) dichloridobis(ureaido)copper(II) D) bis(ureaido)dichloridocopper(II)

6. In the Hydrogen-Oxygen fuel cell, which of the following overall reaction takes place?

A) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ B) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

C) $2H_2(l) + O_2(l) \rightarrow 2H_2O(s)$ D) $2H_2(l) + O_2(l) \rightarrow 2H_2O(l)$

7. Lower boiling point of ethers in comparison to those of alcohols of comparable molecular masses is due to

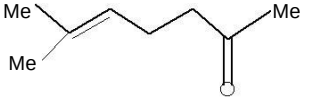
A) polarity of ether B) dipole moment of ether

C) absence of extensive hydrogen bonding D) both A and B

8. The structure of boron nitride is similar to that of

A) acetylene B) graphite C) phosphine D) sodium chloride

9. The IUPAC name of the compound



is

A) 4 - methyl - 3 - hepten - 2 – one B) 2 - methyl - 2 - hepten - 6 - one

C) 6 - methyl - 5 - hepten - 2 – one D) 4 - methyl - 3 - hepten - 2 - one

10. Benzamide can be converted to bezylamine using

A) Br_2 / KOH B) PCl_5 C) $LiAlH_4$ D) $NaBH_4$

MATHEMATICS

1. The line passing through the points A(1, −2, −3) and B(4, -5, -6) intersects the plane $z = 1$ at the point

A) $\frac{7}{3}, -\frac{10}{3}, 1$ B) $-\frac{7}{3}, -\frac{10}{3}, 1$ C) (−3, 2, 1) D) (−3, 6, 1)

2. A box contains 8 items of which 2 are defective. A person draws 3 items from the box. Determine the expected number of defective items.

A) 0.75 B) 0.3 C) 0.2 D) 0.1

3. If a = cos α + i sin α, b = cos β + i sin β, c = cos γ + i sin γ and a + b + c = 0, the value of $a^{-1} + b^{-1} + c^{-1}$ is

A) 1 B) 0 C) −1 D) 2

4. The value of λ for which the system of equations x+y-2z=0, 2x-3y+z=0. x-5y+4z= λ is consistent is

A) λ B) -1 C) 0 D) 2

5. Suppose a and b are vectors such that $a \times b = 2\hat{i} + \hat{j} - \hat{k}$ and $a \cdot b = \hat{i} - \hat{j} + \hat{k}$. The least value of is $|a|$

A) $\frac{1}{\sqrt{2}}$ B) 2 C) $\sqrt{2}$ D) $\sqrt{2} - 1$

6. A general solution to $y'' - \sqrt{5}y = 0$ is

A) $y = c_1 e^{\sqrt{5}t} + c_2 t$ B) $y = c_1 \cos\sqrt{5}t + c_2 \sin\sqrt{5}t$

C) $y = c_1 e^{\sqrt{5}t} + c_2 t e^{\sqrt{5}t}$ D) $y = c_1 e^{4\sqrt{5}t} + c_2 e^{-4\sqrt{5}t}$

7. In a binary communication channel, the probability that a transmitted zero is received as zero is 0.95 and the probability that a transmitted one is received as one is 0.90. If the probability that a zero is transmitted is 0.4, then the probability that a one was transmitted, given that a one was received is

A) $\frac{17}{28}$ B) $\frac{27}{37}$ C) $\frac{29}{37}$ D) $\frac{27}{28}$

8. If (a, b, c) are three vectors such that if $a \times b = c$ and $b \times c = a$, then

A) If a, b and c are pair-wise perpendicular

B) $|a| = |b| = |c| = 1$

C) $|a| = |b| = |c| \neq 1$

D) $|a| \neq |b| \neq |c|$

9. If [×] denotes the greatest integer ≤×, then the value of the integral $\int_4^{10} \frac{[x^2]dx}{[x^2 - 28x + 196] + [x]^2}$ is

A) 0 B) 1 C) 3 D) 4

10. The proposition p ∧ (P∨ q)is

a tautology

a contradiction

logically equivalent to p ∧ q

logically equivalent to p ∨ q

BIOLOGY

1. Chitin, a component of fungal cell walls, is a polymer of

   A) N-acetylglucosamine B) Sialic Acid

   C) N-acetylmuramic Acid D) A disaccharide containing glucose and mannose

2. A mixed cranial nerve is

   A) Auditory B) Abducens C) Facial D) Oculomotor

3. Okazaki fragment refers to

   a. DNA segment involved in recombination
   b. RNA primer segments in the leading strand
   c. Chain of nucleotide segments in the lagging strand
   d. DNA segment formed by endonuclease action

4. Evolution is irreversible. This is known as

   A) Allen's rule B) Dollo law C) Bergman's rule D) Cope's rule

5. Cholesterol is a

   A) derived lipid B) phospholipid C) glycolipid D) simple lipid

6. Which one of the following algae is used for production of agar agar?

   A) Acetabularia B) Macroalgae C) Gelidium D) Rhodoymenia

7. Whose classification system is universally accepted, according to which herbarium sheet is arranged and its dimensions are?

   A) Bentham and Hooker, 11.50 cm-16.50 cm C) Bentham and Hooker, 29 cm-41 cm

   5. Carl Linnaeus, 11.5 inch – 16.50 inch

   D) R.H.Whittaker, 29 cm-41 inch

8. In angiosperms, if the number of chromosomes in endosperms is 30, what will be the number of chromosomes in nucleus?

   A) 15 B) 30 C) 20 D) 40

9. Bt cotton is toxic for some insects but not for animals, because

   A) Animals have Bt toxin resistant genes
   B) Insects are small in size so toxicity will be not expressed
   C) Bt toxin is effective for only flyable organism
   D) Toxin becomes active in insect by alkaline pH of its gut

10. Removal of RNA polymerase III from nucleoplasm will affect the synthesis of

    A) mRNA B) tRNA and mRNA C) tRNA D) hnRNA