IACS UG PG Entrance Exam 09th July 2022

Section : **Physics**

A man of mass m stands at a distance R from the center of a horizontal disc of mass 2m and radius 2R pivoted on a vertical axis through its center about which it can freely rotate. The man now starts to move round the center of the disc in a circle of radius R with a velocityi v relative to the disk. The resulting angular velocity of the disk will be

(a) $-\frac{5v}{R}$
(b) $-\frac{9v}{R}$
(c) $-\frac{v}{9R}$
(d) $-\frac{v}{5R}$

Q.1

Ans ✗ A. a

✗ B. b

✗ C. c

✔ D. d

An ideal gas of $\gamma = 1.5$ is of 10 litre volume at a pressure of 1 atmosphere and temperature 300 K. It is adiabatically expanded to four times its original volume, the final temperature will be,

(a) 150 K
(b) 212.2 K
(c) 200 K
(d) 100 K

Q.2

Ans ✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.3
Ans

A single electron orbits around a stationary nucleus of charge +Ze, where Z is a constant and e is the magnitude of electronic charge. If it requires 68 eV to excite the electron from the second Bohr orbit to the third Bohr orbit, then the value of Z is (The ionization energy of H atom in ground state = 13.6 eV)

(a) 3
(b) 4
(c) 5
(d) 6

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.4
Ans

If the radius of the earth suddenly becomes half of its present value without any change in the mass of the earth, the duration of the day after the contraction will be (Assume the earth to be an uniform sphere of mass M)

(a) 1/2 of its original value
(b) 1/4 of its original value
(c) Twice its original value
(d) Does not change

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.5

Ans   If force F, acceleration A and time T are defined as fundamental physical quantities, the dimension of energy on this system is

(a) FAT
(b) $F^2A^{-1}T$
(c) F^2T
(d) FAT^2

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.6

Ans

You stand in front of a mirror whose top lines up with the top of your head (at which level we will assume your eyes are located.) How far down should the mirror extend so that you can see all the way down to your shoes? Express the answer in terms of your height h.

(a)h
(b)$h/4$
(c)$h/\sqrt{2}$
(d)$h/2$

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.7
Ans

A cylinder contains 12 litres of oxygen at 20° C temperature and 15 atmosphere pressure. The temperature is raised to 35° C, and the volume is reduced to 8.5 litres. What is the final pressure of the gas in atmosphere unit (express your answer to the nearest integer value)? Assume that the gas is ideal.

(a) 37 atmosphere
(b) 22 atmosphere
(c) 15 atmosphere
(d) 9 atmosphere

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.8
Ans

In a Young's double slit experiment, the amplitude of the two waves incident on the two slits are A and 2A, respectively. If I_0 is the maximum intensity, then the intensity at a spot on the screen, where the phase difference between the two interfering waves is ϕ, is given by,

(a) $I_0 \cos^2(\phi/2)$.
(b) $(I_0/3) \left[3 + \sin^2(\phi/2)\right]$.
(c) $(I_0/9) (5 + 4\cos\phi)$.
(d) $(I_0/9) (4 + 5\cos\phi)$.

✗ A. a

✗ B. b

✔ C. c

✗ D. d

A particle starts from rest at $x = 0$ m, with an acceleration 1 m/s^2 along the x-direction. At $t = 5$ s it receives an additional acceleration in the same direction. At $t = 10$ s, its speed is v and position is x. Had the additional acceleration not been provided, its speed and position would have been v_0 and x_0, respectively. It is found that, $x - x_0 = 12.5$ m, then what is $(v - v_0)$?

(a) 20 m/s.
(b) 15 m/s.
(c) 10 m/s.
(d) 5 m/s.

Q.9

Ans ✗ A. a

✗ B. b

✗ C. c

✔ D. d

The work-function of a certain metal is W. Let ω_0 be the minimum frequency of light that can cause photo-emission by the photo-electric effect. At double this frequency ($= 2\omega_0$), what will be the velocity of the emitted electron? Assume that the electron has a speed much smaller than the speed of light, and its mass is m_e.

(a) $\sqrt{W/m_e}$
(b) $\sqrt{4W/m_e}$
(c) $\sqrt{W/2m_e}$
(d) $\sqrt{2W/m_e}$

Q.10

Ans ✗ A. a

✗ B. b

✗ C. c

✔ D. d

A mass m moving horizontally with velocity v_0 on a frictionless table strikes a spring of force constant k. It compresses the spring and then bounces back with opposite velocity. Assuming no loss of energy anywhere, the maximum compression of the spring is given by

(a) $v_0\sqrt{m/k}$
(b) $(v_0/2)\sqrt{m/k}$
(c) $v_0\sqrt{k/m}$
(d) $(1/v_0)\sqrt{k/m}$

Q.11

Ans ✔ A. a

✘ B. b

✘ C. c

✘ D. d

A rod extends from $x = -a$ to $x = +a$ and carries a total charge $+Q$ uniformly distributed on it. Let the magnitude of the electric force due to the rod on test charges $+q_0$, placed at $x = 2a$ and $x = 4a$ be F_{2a} and F_{4a}, respectively. What is the ratio of the forces F_{2a}/F_{4a}?

(a) 4
(b) 5
(c) 9
(d) 25/9

Q.12

Ans ✘ A. a

✔ B. b

✘ C. c

✘ D. d

Imagine four charges of magnitude $-q$ are placed at the four corners of a square, with the length of each side of the square being $\sqrt{2}a$. Another charge $+q$ is placed at the center of the square. Compute the magnitude of the electric force F_1 on the charge $+q$. Now remove the $-q$ charge from the top right corner of the square. With this new configuration, compute the magnitude of the electric force F_2 on the charge $+q$. The magnitude of the forces are given by (with ϵ_0 being the permittivity constant)

(a) $F_1 = 0, \quad F_2 = q^2/(4\pi\epsilon_0 a^2)$
(b) $F_1 = 0, \quad F_2 = 3q^2/(4\pi\epsilon_0 a^2)$
(c) $F_1 = 4q^2/(4\pi\epsilon_0 a^2), \quad F_2 = 3q^2/(4\pi\epsilon_0 a^2)$
(d) $F_1 = 4q^2/(4\pi\epsilon_0 a^2), \quad F_2 = q^2/(4\pi\epsilon_0 a^2)$

Q.13

Ans ✔️ A. a

✖️ B. b

✖️ C. c

✖️ D. d

Three concentric metallic spherical shells with radii R, $2R$ and $3R$, are given charges Q_1, Q_2 and Q_3, respectively. It is observed that the surface charges on the outer surface of each of these shells are identical. Then the ratio $Q_1 : Q_2 : Q_3$, of charges attributed to each of the shells is given by,

(a) 1:2:3.
(b) 1:3:5.
(c) 1:3:9.
(d) 1:4:9.

Q.14

Ans ✖️ A. a

✔️ B. b

✖️ C. c

✖️ D. d

Q.15

A LC circuit is initially kept open and the charge on the capacitor is 2×10^{-5} C. If the natural frequency of the circuit is 4000 rad/sec, maximum current flowing through the circuit in the closed condition is,
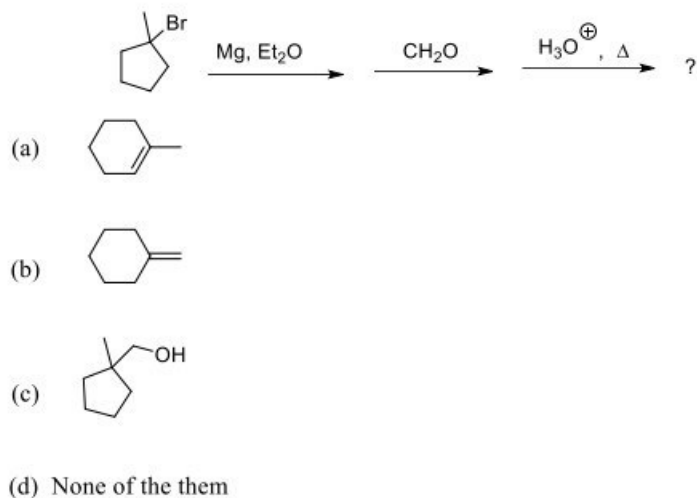
a) 8 mA
b) 80 mA
c) 2 mA
d) 20 mA

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

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Section : **Chemistry**

Q.1 Identify the structure of the final product (major) of the following sequence of reactions.

$\xrightarrow{\text{Mg, Et}_2\text{O}}$ $\xrightarrow{\text{CH}_2\text{O}}$ $\xrightarrow{\text{H}_3\text{O}^{\oplus}, \, \Delta}$?

(a)

(b)

(c)

(d) None of the them

Ans ✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.2
Ans

. A reaction A+B→C, follows first order kinetics with respect to each reactant, with an overall rate constant of $k = 2.0 \times 10^{-3}$ $M^{-1}s^{-1}$. The initial concentration of A and B are 0.10 M and 6.93 M, respectively. Given ln2 = 0.693, choose the correct statement.

(a) The concentration of A remaining after 100 seconds is approximately 2.5×10^{-2} M.
(b) The concentration of B remaining after 100 seconds is approximately 1.73 M.
(c) The half-life of A is about 100 seconds.
(d) The half-life of B is about 50 seconds.

✔️ A. a

❌ B. b

❌ C. c

❌ D. d

Q.3
Ans

What is the four-electron reduced species of dioxygen?

(a) oxide
(b) superoxide
(c) peroxide
(d) ozone

✔️ A. a

❌ B. b

❌ C. c

❌ D. d

Q.4
Ans

Which of following modes of packing of atoms have the same packing efficiency?

(a) Simple cubic and body-centered cubic.
(b) Face-centered cubic packing and hexagonal close packing.
(c) Body-centered cubic and face-centered cubic packing.
(d) Face-centered cubic packing and Simple Cubic packing.

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.5
Ans

Ammonium hydroxide is produced by dissolving gaseous ammonia in water. Calculate the pH of an ammonium hydroxide solution that contains 7.0 g NH_4OH per litre. The value of the base dissociation constant (K_b) for ammonium hydroxide is 1.8×10^{-5}.
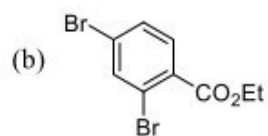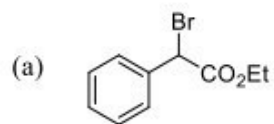
(a) 2.72
(b) 7.18
(c) 11.28
(d) 10.28

✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.6
Ans

Identify the structure of the final product of the following reaction:

i) KMnO$_4$/KOH

ii) Br$_2$/FeBr$_3$

iii) EtOH/H$^\oplus$

→ ?

(a)

(b)

(c)

(d)
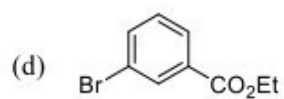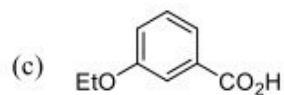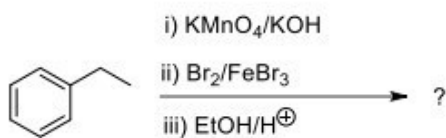
✗ A. a

✗ B. b

✗ C. c

✓ D. d

Q.7
Ans

Which of the following set of quantum numbers represent a 4*f* orbital?

(a) $n = 2, l = 0, m_l = 0$
(b) $n = 3, l = 1, m_l = -1$
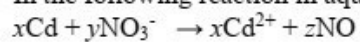(c) $n = 4, l = 3, m_l = -3$
(d) $n = 4, l = 4, m_l = 1$

✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.8
Ans

In the following reaction in aqueous solution, what are the values of x, y and z:
$$xCd + yNO_3^- \rightarrow xCd^{2+} + zNO$$

(a) 1, 2, 3
(b) 2, 2, 3
(c) 3, 2, 1
(d) 3, 2, 2

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.9
Ans

The half-life ($t_{1/2}$) of a chemical reaction in 10.5 days, its full life is:

(a) 21 days
(b) 42 days
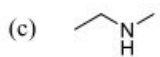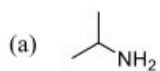(c) 5.25 days
(d) Infinity

✗ A. a

✗ B. b

✗ C. c

✓ D. d

Q.10 An organic compound **P** (C₃H₉N), when treated with nitrous acid, gave an alcohol and N₂ gas was evolved. **P** on reaction with CHCl₃ and caustic potash gave **Q**, which on reduction gave isopropyl methyl amine. Identify the structure of **P**.
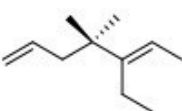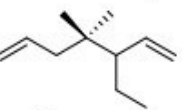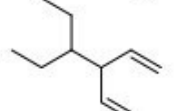
(a) (isopropylamine with NH₂)

(b) (n-propyl chain with NH₂)

(c) (secondary amine N–H)

(d) (tertiary amine N)
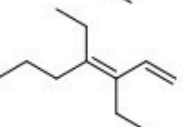
Ans ✔ A. a

✘ B. b

✘ C. c

✘ D. d

Which one among the given dienes will exist in a mixture of enantiomers?

(a)

(b)

(c)

(d)

Q.11

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

Predict the geometry and shape of XeO_3.

(a) Td, Sq. planar
(b) Td, pyramidal
(c) Oh, Sq. pyramid
(d) Td, trigonal planar

Q.12

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

If one assumes linear structure instead of bent structure for water, then which one of the following properties cannot be explained?

(a) The formation of intermolecular hydrogen bond in water
(b) The high boiling point of water
(c) Solubility of polar compounds in water
(d) It would become paramagnetic

Q.13

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

Three hexoses form same osazone when treated with excess phenyl hydrazine. Identify the hexoses.

(a) D-glucose, D-galactose and D-talose

(b) D-fructose, D-mannose and D-galactose

(c) D-glucose, D-mannose and D-fructose

(d) D-glucose, D-galactose and D-fructose

Q.14

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.15 The complex $[Mn(CN)_6]^{x-}$ exhibits a spin-only magnetic moment value of 3.88 BM. What is the value of x?

(a) 1
(b) 2
(c) 3
(d) 4

Ans ✗ A. a

✓ B. b

✗ C. c

✗ D. d

Section : **Mathematics**

Q.1 In how many ways can one choose three distinct elements from the set $\{1, 2, \cdots, 30\}$ so that the last digit of their product is either 1 or 3 or 7 or 9?

(a) 110

(b) 220

(c) 330

(d) 440

Ans ✗ A. a

✓ B. b

✗ C. c

✗ D. d

Q.2
Ans

The three planes $x + y = 0$, $y + z = 0$ and $x + z = 0$

(a) meet in a straight line

(b) meet at a unique point

(c) do not meet

(d) meet in two parallel lines

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.3
Ans

Let A be the set of all intergers obtained by multiplying any five distinct integers between 1 and 100. What is the largest integer n such that 2^n divides at least one element of A?

(a) 8

(b) 20

(c) 24

(d) 25

✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.4
Ans

For each $n \geq 1$, let A_n denote the area of the region S_n in $\mathbb{R}^2$ defined as
$$S_n = \{(x, y) \in \mathbb{R}^2 : |x|^{1/n} + |y|^{1/n} \leq 1\}$$
Then the limit $\lim_{n \to \infty} A_n$ equals

(a) 1

(b) 0

(c) 4

(d) π

✘ A. a

✔ B. b

✘ C. c

✘ D. d

Q.5
Ans

If $\omega \neq 1$ is a complex cube root of unity, then the value of $(1 + \omega - \omega^2)^{27}$ is

(a) $128\,\omega$

(b) $-128\,\omega$

(c) $128\,\omega^2$

(d) $-128\,\omega^2$

✘ A. a

✘ B. b

✘ C. c

✔ D. d

Q.6
Ans

Let C_1 and C_2 be two circles lying in the same quadrant of the x-y plane and each touching both the axes. Suppose also that C_1 and C_2 touch each other externally. If the smaller of the two circles has area 1, what is the area of the larger circle?

(a) $(\sqrt{2} + 1)^2$

(b) $\left(\dfrac{\sqrt{2} + 1}{\sqrt{2} - 1} \right)^2$

(c) $(2 + \sqrt{2})^2$

(d) 4

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.7
Ans

What are all the non-zero real-valued continuous functions f on $\mathbb{R}$ that satisfy

$$f(x) \cdot f(y) = f(x - y), \text{ for all } x, y \in \mathbb{R}?$$

(a) Only the constant function $f \equiv 1$

(b) Only the constant function $f \equiv -1$

(c) f need not be constant, but takes values only in $\{1, -1\}$

(d) No such non-zero f exists.

✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.8
Ans

Let a, b, c be three real numbers, each strictly greater than 1, such that
$$\frac{2}{3} \log_b a + \frac{3}{5} \log_c b + \frac{5}{2} \log_a c = 3.$$
If the value of b equals 9, then the value of a must be

(a) $\sqrt[3]{81}$

(b) 18

(c) $\dfrac{27}{2}$

(d) 27

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.9
Ans

If a and b are any two strictly positive real numbers, then which of the following inequalities is always true?

(a) $\dfrac{a}{b^2} + \dfrac{b}{a^2} \geq \dfrac{2}{a}$

(b) $\dfrac{a}{b^2} + \dfrac{b}{a^2} \geq \dfrac{2}{b}$

(c) $\dfrac{a}{b^2} + \dfrac{b}{a^2} \geq \dfrac{2}{a} + \dfrac{2}{b}$

(d) $\dfrac{a}{b^2} + \dfrac{b}{a^2} \geq \dfrac{1}{a} + \dfrac{1}{b}$

✗ A. a

✗ B. b

✗ C. c

✔ D. d

Suppose that for some positive integer $n \geq 1$, the numbers 2^n and 5^n both start with the same digit d. What must be the digit d?

(a) 2

(b) 5

(c) 3

(d) 1

Q.10

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

Among all the factors of $8^5 \times 6^7 \times 21^8$ (including the factor 1), the number of factors which are perfect squares, is

(a) 308

(b) 480

(c) 520

(d) 640

Q.11

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

Let $x_1, \cdots, x_{16}$ be real numbers satisfying $x_1^2 + \cdots + x_{16}^2 = 1$. Then the maximum possible value of $|x_1| + \cdots + |x_{16}|$ is

(a) 4

(b) 16

(c) 256

(d) none of the above

Q.12

Ans ✔ A. a

✘ B. b

✘ C. c

✘ D. d

If a, b, c are in G.P., then the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if

(a) $d/a, e/b, f/c$ are in A.P.

(b) $d/a, e/b, f/c$ are in G.P.

(c) $d/a, e/b, f/c$ are in H.P.

(d) none of the above.

Q.13

Ans ✔ A. a

✘ B. b

✘ C. c

✘ D. d

Let V be the set of vertices of a regular polygon with twenty sides. If three distinct vertices are chosen at random from V, what is the probability that the chosen triplet represents the vertices of a right-angled triangle?

(a) $\dfrac{7}{19}$

(b) $\dfrac{3}{38}$

(c) $\dfrac{1}{38}$

(d) $\dfrac{3}{19}$

Q.14

Ans

  ✗ A. a

  ✗ B. b

  ✗ C. c

  ✔ D. d

Fix two disjoint 3-element subsets S_1 and S_2 of the set $A = \{1, 2, \cdots, 20\}$. How many 3-element subsets of A are there, which have exactly one element common with S_1 and at least one element common with S_2?

(a) 51

(b) 102

(c) 135

(d) 153

Q.15

Ans

  ✗ A. a

  ✗ B. b

  ✔ C. c

  ✗ D. d

Section : **Biology**

Q.1
Ans

The initial step in the digestion of milk in infants is carried out by

    (a) Lipase

    (b) Trypsin

    (c) Rennin

    (d) Pepsin

✘ A. a

✘ B. b

✔ C. c

✘ D. d

Q.2
Ans

The fish without any bone is-

    (a) Whale

    (b) Rohu

    (c) Shark

    (d) Lungfish

✘ A. a

✘ B. b

✔ C. c

✘ D. d

Q.3
Ans

The process of synthesis of DNA from RNA is known as-

(a) Replication

(b) Translation

(c) Reverse transcription

(d) Transcription

✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.4
Ans

Which bond can be found between the base and the sugar in a nucleotide?

(a) N glycosidic bond

(b) O glycosidic bond

(c) Hydrogen bond

(d) None of the above

✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.5
Ans

Okazaki fragments occur in-

(a) 3'-5' strand of DNA template

(b) 5'-3' strand of DNA template

(c) 5'-3' strand of RNA template

(d) None of the above

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.6
Ans

One strand of DNA has the following sequence of nucleotide 3' ATTCGCTAT 5' so the other strand of DNA has

(a)   5' TAAGCGATA 3'

(b)   3' TAAGCGATA 5'

(c)   5' GACGCGATA 3'

(d)   3' GACGCGATA 5'

✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.7
Ans

Blood can be pumped up the legs against gravity because

(a)   The heart is strong enough

(b)   The blood flow is unidirectional (towards the heart) due to the opening of small valves

throughout the veins during muscle contractions as we walk and move about

(c)   Blood during upward movement gets thinner

(d)   Blood flow during upward movement gets much slower than the downward movement

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.8
Ans

If a person having blood group A (heterozygous) marries a lady having blood group B (heterozygous), what would be the possibility of the blood group of their children?

(a)   AB, O

(b)   A, B, AB, O

(c)   A, B

(d)   B, O, A

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Which organelle is responsible for the conversion of lipid molecules to carbohydrates in plants which is not present in animals.

(a) Chloroplast

(b) Glyoxisomes

(c) Amyloplast

(d) Lysosome

Q.9

Ans ✗ A. a

✓ B. b

✗ C. c

✗ D. d

Where does rRNA synthesis occur?

(a) Nucleolus

(b) Golgi

(c) Cytoplasm

(d) ER

Q.10

Ans ✓ A. a

✗ B. b

✗ C. c

✗ D. d

With reference to enzymes, which one of the following statements is true?

(a) Apoenzyme = Holoenzyme + Coenzyme

(b) Holoenzyme = Apoenzyme + Coenzyme

(c) Coenzyme = Apoenzyme + Holoenzyme

(d) Holoenzyme = Coenzyme − Apoenzyme

Q.11

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

Energy for ATP synthesis is obtained from
(a) Oxygen ion gradient
(b) Hydrogen ion gradient
(c) Nitrogen ion gradient
(d) All of the above

Q.12

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

In anaerobic respiration, 4 molecules of glucose produce-

(a) 144 ATP

(b) 20 ATP

(c) 16 ATP

(d) 8 ATP

Q.13

Ans ✗ A. a

✗ B. b

✗ C. c

✔ D. d

Identify the amino acid which has Hydroxymethyl as its R group

(a) Glycine

(b) Phenylalanine

(c) Serine

(d) Cysteine

Q.14

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.15 Given below is a sequence of a sample of DNA

5'-GAATTC-3'

3'-CTTAAG-5'what is especially shown to it?

(a) Deletion mutation

(b) Palindromic sequence

(c) Start codon at 5' end

(d) Replication completed

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

Section : **Computer Science**

Q.1
Ans

Suppose you have two sorted arrays A[0:N-1] and B[0:N-1], each containing N integers. No element is common in the two arrays. Consider the following procedure

Procedure printSeq(integer A[], integer B[], integer N) {
```
    integer i, j
    i = j = 0
    while (i < N AND j < N) {
        if (A[i] < B[j]) {
            print(A[i])
            i = i + 1
        } else {
            print(B[j])
            j = j+1
        }
    }
}
```

Which of the following statements is TRUE regarding the above procedure?

(a) It prints all the elements of the two arrays such that the printed sequence is sorted.
(b) It prints the elements of array A followed by the elements of array B.
(c) It may not print all the elements of the two arrays but the printed sequence is sorted.
(d) It prints a sorted sequence such that the elements at the even indices (i.e., 0, 2, 4, ...) in the sequence are from array A and the elements at the odd indices (i.e., 1, 3, 5, ...) are from array B.

✘ A. a

✘ B. b

✔ C. c

✘ D. d

Q.2
Ans

Which of the following statements is FALSE?

(a) UNIX operating system treats peripheral devices as if they are files.
(b) An operating system is responsible for scheduling processes for execution.
(c) An operating system cannot execute multiple processes at the same time even in a multi-core system.
(d) An operating system manages the use of main memory.

✗ A. a

✗ B. b

✔ C. c

✗ D. d

Q.3

Left column below shows examples of software and the right column are the functionalities. Which of the following shows the correct match of software to their functionality?

I.	Windows	A.	Boot Loader
II.	GCC	B.	Operating System
III.	GRUB	C.	Editor
IV.	MS Word	D.	Compiler

(a) I-B, II-C, III-A, IV-D

(b) I-B, II-D, III-A, IV-C

(c) I-B, II-D, III-C, IV-A

(d) I-A, II-D, III-B, IV-C

Ans ✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.4
Ans

Consider the following pseudo-code for **Procedure f(integer n)**, which assumes the availability of **Procedure GCD(integer a, integer b)** that returns the greatest common divisor of two integers a and b.

Procedure f (integer n) {

```
        integer i = 2
        integer result = 1
        while (i < n) {
                if (GCD (i, n) == 1) {
                        result = result + 1
                }
                i = i+1
        }
        return result;
}
```

What does the above **Procedure f(integer n)** do?

(a) It returns the number of integers between 1 and n that are relatively prime to n.
(b) It returns the number of co-prime integers between 1 and n.
(c) It returns the number of primes less than n.
(d) It returns the number of integers between 1 and n that are *not* relatively prime to n.

✔ A. a

✘ B. b

✘ C. c

✘ D. d

Q.5
Ans

Which of the following statement about searching a key from a given list of N numbers is FALSE?
(a) Binary searching requires the list of numbers to be sorted.
(b) The number of comparisons in linear searching is generally greater than in binary searching.
(c) When the key is not present in the list of numbers, binary searching performs N comparisons.
(d) When the key is not present in the list of numbers, linear searching performs N comparisons.

✘ A. a

✘ B. b

✔ C. c

✘ D. d

Q.6
Ans

How may comparisons will be performed by linear search algorithm when searching the key -2 in the list [10, 2, -3, 5, 9, -2, 7, 9]?
(a) 5
(b) 2
(c) 4
(d) 6

✘ A. a

✘ B. b

✘ C. c

✔ D. d

Q.7
Ans

In a deque, if insertion and deletion of elements is done from the same end, it will behave as:
(a) Queue
(b) Stack
(c) List
(d) Dictionary

✗ A. a

✔ B. b

✗ C. c

✗ D. d

Q.8
Ans

The binary and octal representation of the decimal number 122 are respectively:
(a) 1111010 and 172
(b) 0101111 and 72
(c) 111101 and 271
(d) 111010 and 720

✔ A. a

✗ B. b

✗ C. c

✗ D. d

Q.9

What will be the output of the pseudocode below given the inputs: X=50, Y=20 and
Z=30.
```
INPUT X, Y, Z
IF (X > Y) THEN
        W = Y; Y = X;
ELSE
        W = X;
IF (Z < Y) THEN
        IF (W>Z) THEN
                W=Z;
        Z = Y;
PRINT W, Z
END
```

(a) 30, 20
(b) 50, 20
(c) 30, 50
(d) 20, 50

Ans   ✗ A. a

✗ B. b

✗ C. c

✔ D. d

In the pseudocode of the program below, what will be the instruction in line 2 and line 5 respectively such that the execution of this program prints 120?

1. SET n = 5
2. ------------
3. SET count = 1
4. WHILE (count <= n) DO
5.   ------------------------
6.   INCREMENT count
7. PRINT p
8. END

(a) SET p = 0, p = p * p
(b) SET p = 1, p = p * p
(c) SET p = 1, p = p * count
(d) SET p = 1, p = p + count

Q.10

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

What is the minimum number of gates required to implement the following Boolean expression? AB + A(A + C) + B(A + C)

(a) 4
(b) 3
(c) 2
(d) 1

Q.11

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

Boot loader is a program that is responsible to load the operating system into the main memory of the computer. The boot loader resides in which type of memory?

(a) RAM
(b) Volatile Memory
(c) ROM
(d) Cache Memory

Q.12

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

The deletion operation on a Queue data-structure that is empty results in:

(a) Overflow
(b) The element at the front of the Queue is returned
(c) The element at the rear of the Queue is returned
(d) Underflow

Q.13

Ans ✗ A. a

✗ B. b

✗ C. c

✔ D. d

Q.14

Which of the following statement about the time complexity of an algorithm is FALSE?

(a) Any algorithm that does not have any loop will have a constant time complexity.

(b) Any algorithm that has a single loop (1 to n) where n is an input to the algorithm has linear time complexity.

(c) Any algorithm that has a nested loop (both 1 to n) where n is an input to the algorithm has linear time complexity.

(d) Complexity analysis is performed to explain how an algorithm will perform when the input grows larger.

Ans ✗ A. a

✗ B. b

✔ C. c

✗ D. d

:

Q.15

Conversion of the infix expression **A * ((C + D) / E)** to postfix gives:

(a) A C D + E / *

(b) A C D + E * /

(c) C D + E / * A

(d) A C D + / * E

Ans ✔ A. a

✗ B. b

✗ C. c

✗ D. d