

| Section A: Q.1 – Q.10 Carry ONE mark each. | |
|---|---|
| Q.1 | Which of the following is involved in innate immune response in higher mammals? |
| (A) | T cell antigen receptor |
| (B) | B cell antigen receptor |
| (C) | Toll-like receptor |
| (D) | Major histocompatibility complex-II molecule |
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| Q.2 | Which among the following belongs to the family “Retroviridae”? |
| (A) | Human Immunodeficiency virus |
| (B) | Ebola virus |
| (C) | Dengue virus |
| (D) | Influenza virus |
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| Q.3 | Which of the following is a glycolipid? |
| (A) | Cerebroside |
| (B) | Phosphatidylcholine |
| (C) | Phosphatidylserine |
| (D) | Cardiolipin |
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| Q.4 | Which of the following bacterial component contains “dipicolinic acid”? |
| (A) | Endospore |
| (B) | Capsule |
| (C) | Flagella |
| (D) | Pili |
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| Q.5 | The fossilization process in which mineral rich water penetrates through the pores of decomposed organic matter is known as ____. |
| (A) | Carbonization |
| (B) | Chemical fossilization |
| (C) | Petrifaction |
| (D) | Microfossilization |
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| Q.6 | A random fluctuation in gene frequency is called |
| (A) | Genetic drift |
| (B) | Genetic load |
| (C) | Panmixis |
| (D) | Genetic shift |
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| Q.7 | The number of “Barr Bodies” present in a somatic cell of a woman suffering from Turner syndrome is ____. |
| (A) | 0 |
| (B) | 1 |
| (C) | 2 |
| (D) | 3 |
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| Q.8 | Which of the following are produced by Mangrove trees to survive in the waterlogged swampy forests? |
| (A) | Trichomes |
| (B) | Pneumatophores |
| (C) | Spermatophores |
| (D) | Cambia |
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| Q.9 | Indeterminate growth in plants is due to the presence of perpetually undifferentiated tissues, called as _____. |
| (A) | Tracheids |
| (B) | Meristems |
| (C) | Parenchyma |
| (D) | Sclerenchyma |
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| Q.10 | The osmotic potential (ψ) of pure water is _____ MPa. |
| (A) | -1 |
| (B) | 0 |
| (C) | 0.1 |
| (D) | 10 |
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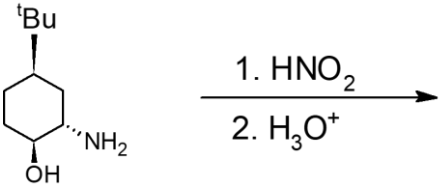
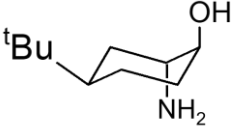
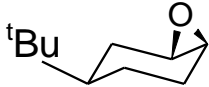
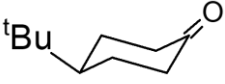
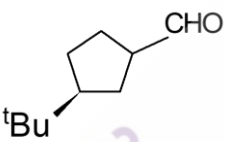
| Section A: Q.11 – Q.30 Carry TWO marks each. | |
|---|---|
| Q.11 | Bacteria containing a tuft of flagella that comes out from one pole is called ____. |
| (A) | Lophotrichous |
| (B) | Peritrichous |
| (C) | Monotrichous |
| (D) | Amphitrichous |
| | |
| Q.12 | Which of the following activity is associated with <i>Klenow</i> fragment? |
| (A) | 5'-3' exonuclease activity |
| (B) | 5'-3' endonuclease activity |
| (C) | Polymerase activity |
| (D) | 3'-5' endonuclease activity |
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| Q.13 | A frameshift mutation is caused by ____. |
| (A) | 5-Bromouracil |
| (B) | Acridine |
| (C) | Glutathione |
| (D) | Hypoxanthine |
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| Q.14 | The zone of a pond system where respiration is more than production is called as ____. |
| (A) | Limnetic zone |
| (B) | Littoral zone |
| (C) | Epilimnion zone |
| (D) | Benthic zone |
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| Q.15 | An organism that causes obstruction of lymphatic system in humans is ____. |
| (A) | <i>Borrelia burgdorferi</i> |
| (B) | <i>Brucella abortus</i> |
| (C) | <i>Yersinia pestis</i> |
| (D) | <i>Wuchereria bancrofti</i> |
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| Q.16 | A man having a dominant genetic trait (TT genotype) can taste phenylthiocarbamide (PTC), marries a woman who cannot taste PTC. The PTC tasting ability of their biological son and daughter is |
| (A) | Son taster; Daughter non-taster |
| (B) | Daughter taster; Son non-taster |
| (C) | Both are non-tasters |
| (D) | Both are tasters |
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| Q.17 | Which of the following enzymes is absent in a person suffering from Alkaptonuria? |
| (A) | Tyrosinase |
| (B) | Homogentisic acid oxidase |
| (C) | Catechol dioxygenase |
| (D) | Phenylalanine hydroxylase |
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| Q.18 | The bacterium that can tolerate high concentrations of salt and also ferment mannitol is |
| (A) | <i>Staphylococcus aureus</i> |
| (B) | <i>Staphylococcus epidermis</i> |
| (C) | <i>Streptococcus pyogenes</i> |
| (D) | <i>Serratia marcescens</i> |
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| Q.19 | Match the following | | | | | | | | | | |
|--------------------|---|--|----------|-----------------|--|------------------|--|--------------|--|--------------------|---|
| | <table><thead><tr><th>Group I</th><th>Group II</th></tr></thead><tbody><tr><td>P) Streptomycin</td><td>1) Inhibits beta-subunit of RNA polymerase</td></tr><tr><td>Q) Cycloheximide</td><td>2) Inhibits peptidyl transferase activity of 50S subunit</td></tr><tr><td>R) Rifamycin</td><td>3) Inhibits peptidyl transferase activity of 60S subunit</td></tr><tr><td>S) Chloramphenicol</td><td>4) Inhibits binding of formyl methionine tRNA to ribosome</td></tr></tbody></table> | Group I | Group II | P) Streptomycin | 1) Inhibits beta-subunit of RNA polymerase | Q) Cycloheximide | 2) Inhibits peptidyl transferase activity of 50S subunit | R) Rifamycin | 3) Inhibits peptidyl transferase activity of 60S subunit | S) Chloramphenicol | 4) Inhibits binding of formyl methionine tRNA to ribosome |
| | Group I | Group II | | | | | | | | | |
| | P) Streptomycin | 1) Inhibits beta-subunit of RNA polymerase | | | | | | | | | |
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| R) Rifamycin | 3) Inhibits peptidyl transferase activity of 60S subunit | | | | | | | | | | |
| S) Chloramphenicol | 4) Inhibits binding of formyl methionine tRNA to ribosome | | | | | | | | | | |
| (A) | P-1, Q-3, R-4, S-2 | | | | | | | | | | |
| (B) | P-4, Q-3, R-1, S-2 | | | | | | | | | | |
| (C) | P-2, Q-3, R-1, S-4 | | | | | | | | | | |
| (D) | P-3, Q-4, R-1, S-2 | | | | | | | | | | |
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| Q.20 | The major product formed in the given reaction is  |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |
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| Q.21 | DNA gyrase can |
| (A) | cut single-stranded DNA |
| (B) | relax supercoiled DNA |
| (C) | introduce negative supercoiling in DNA |
| (D) | not utilize ATP |
| | |
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| Q.22 | The stationary phase of cation-exchange chromatography can be |
| (A) | DEAE-cellulose |
| (B) | CM-cellulose |
| (C) | Sephadex G-50 |
| (D) | Heparin-Sepharose |
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| Q.23 | Components of a Transmission Electron Microscope are |
| (A) | Electron gun, objective lens, positron beam, projector lens |
| (B) | Neutron beam, projector lens, objective lens, evacuated tube |
| (C) | Electron beam, projector lens, objective lens, condenser lens |
| (D) | X-ray beam, projector lens, objective lens, condenser lens |
| Q.24 | In a honey bee population, the workers are infertile but protect the queen from intruders and help in reproduction. This is an example of |
| (A) | K selection |
| (B) | Sexual selection |
| (C) | Kin selection |
| (D) | Disruptive selection |
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| Q.25 | <p>For an enzyme following Michaelis-Menten kinetics, when $[S]=K_M$ then, the velocity v is</p> <p><i>([S] is substrate concentration, K_M is Michaelis constant, V_{max} is maximal velocity)</i></p> |
| (A) | $[S] \times V_{max}$ |
| (B) | $0.75 \times V_{max}$ |
| (C) | $0.5 \times V_{max}$ |
| (D) | $K_M \times V_{max}$ |
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| Q.26 | <p>The net equation for aerobic glycolysis is</p> |
| (A) | $\text{Glucose} + 2\text{ATP} \longrightarrow 2 \text{ lactate} + 2\text{ADP} + 2\text{P}_i$ |
| (B) | $\text{Glucose} + 2\text{ADP} + 2\text{P}_i + 2\text{NAD}^+ \longrightarrow 2 \text{ pyruvate} + 2\text{ATP} + 2\text{NADH} + 2\text{H}_2\text{O} + 4\text{H}^+$ |
| (C) | $\text{Glucose} + 2\text{ADP} + 2\text{P}_i \longrightarrow 2 \text{ pyruvate} + 2\text{ATP} + 2\text{H}_2\text{O}$ |
| (D) | $\text{Glucose} + 2\text{ADP} + 2\text{P}_i + 2\text{NAD}^+ \longrightarrow 2 \text{ lactate} + 2\text{ATP} + 2\text{NADH} + 2\text{H}_2\text{O} + 4\text{H}^+$ |
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| Q. 27 | In the electron transport chain, flavin mononucleotide (FMN) can adopt _____ as the highest oxidation state and is capable of accepting or donating _____ electrons, respectively. |
| (A) | 2; 2 or 3 |
| (B) | 2; 1 or 2 |
| (C) | 3; 2 or 3 |
| (D) | 3; 1 or 2 |
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| Q.28 | In bacteria, the σ factor that plays a major role in transcription during the stationary phase is |
| (A) | σ^{70} |
| (B) | σ^{54} |
| (C) | σ^{28} |
| (D) | σ^{32} |
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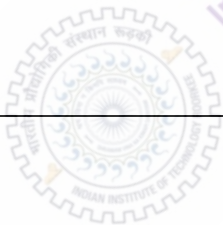
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| Q.29 | A rise in cytosolic calcium ion concentration just after fertilization in a sea urchin egg leads to |
| (A) | Formation of fertilization envelope |
| (B) | Acrosomal reaction |
| (C) | Formation of vegetal pole |
| (D) | Formation of animal pole |
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| Q.30 | In a nephron, _____ follows the ascending limb of the “loop of Henle”. |
| (A) | Descending limb |
| (B) | Distal tubule |
| (C) | Collecting tubule |
| (D) | Proximal tubule |

| Section B: Q.31 – Q.40 Carry TWO marks each. | |
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| Q.31 | Transpirational pull that extends down to the roots in plants can be interrupted by |
| (A) | Process of cavitation |
| (B) | Process of gravitation |
| (C) | Formation of water vapor pockets |
| (D) | Positive pressure in xylem sap |
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| Q.32 | Transfer of plasmids into animal cells can be achieved by |
| (A) | Electroporation |
| (B) | Liposome-mediated process |
| (C) | Calcium chloride treatment |
| (D) | Sucrose treatment |
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| Q.33 | Archaeal cell membranes contain lipids that are |
| (A) | Ether linked |
| (B) | Ester linked |
| (C) | Branched alkyl chain |
| (D) | Linear alkyl chain |
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| Q.34 | Which of the following are producers in an ecological system? |
| (A) | Macrophytes |
| (B) | Phytoplanktons |
| (C) | Zooplanktons |
| (D) | Cyanobacteria |
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| Q.35 | Which of the following acts as wound hormones in plants? |
| (A) | Ethylene |
| (B) | Cytokinins |
| (C) | Abscisic acid |
| (D) | Dextrin |
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| Q.36 | The enriched media used to facilitate the growth of fastidious microorganisms are |
| (A) | Selenite F broth |
| (B) | Blood agar |
| (C) | Chocolate agar |
| (D) | Loeffler's serum |
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| Q.37 | Match the bacterial structure to function (i) Cell wall (a) Virulence factor (ii) Glycocalyx (b) Selective permeability (c) Attachment to surfaces (d) Protection from osmotic lysis |
| (A) | (i)-(b), (ii)-(d) |
| (B) | (i)-(d), (ii)-(a) |
| (C) | (i)-(c), (ii)-(b) |
| (D) | (i)-(d), (ii)-(c) |
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JAM 2022
Joint Admission test for Masters
संयुक्त स्नातकोत्तर उपाधि प्रवेश परीक्षा

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| Q.38 | Identify the correct pairs: (i) Thermophile (a) grows optimal at 37 °C (ii) Mesophile (b) grows optimal at low temperature (iii) Psychrophile (c) grows optimal at high saline conditions (iv) Halophile (d) grows optimal at 67 °C |
| (A) | (i)-(d) |
| (B) | (ii)-(b) |
| (C) | (iii)-(a) |
| (D) | (iv)-(c) |
| Q.39 | A single copy of an allele in sickle-cell heterozygous individuals reduces the frequency and severity of malaria. The reason for this is |
| (A) | Low oxygen binding capacity of hemoglobin |
| (B) | Single amino acid substitution in hemoglobin deforms the red blood cells |
| (C) | Abnormal hemoglobin is toxic for malaria parasite |
| (D) | Malaria parasite escapes the deformed red blood cells |

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| Q.40 | The correct statement/s for bimolecular nucleophilic substitution reactions is/are |
| (A) | It goes through a carbocation formation |
| (B) | There is an inversion of configuration if the reacting center is chiral |
| (C) | Reaction is enhanced when carried out in polar solvents |
| (D) | The reaction intermediate is trigonal bipyramidal |
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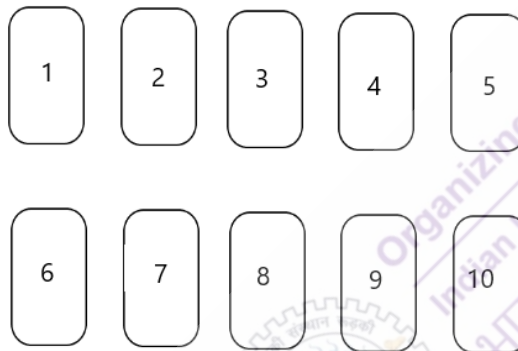


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Section C: Q.41 – Q.50 Carry ONE mark each.

Q.41 A deck of ten cards is given to you as shown below in the figure. One card is drawn at random from this deck. The probability of selecting a number less than 9 is _____. (to one decimal place)

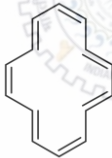


Q.42 The average of all positive even integers less than or equal to 40 is _____.

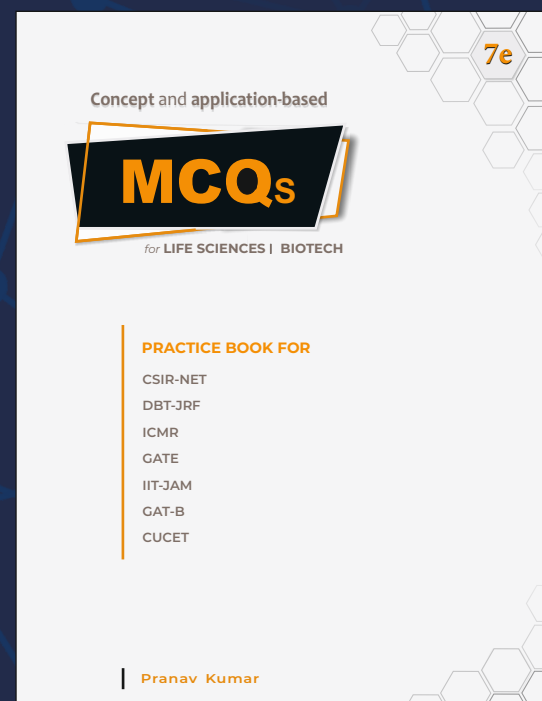
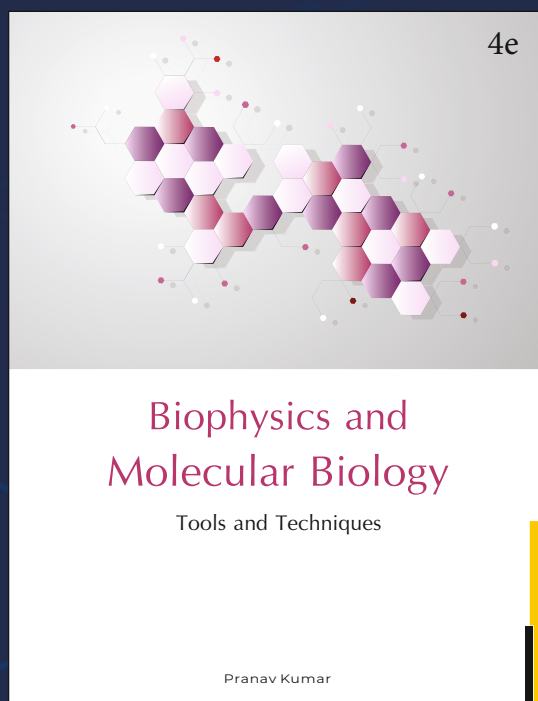
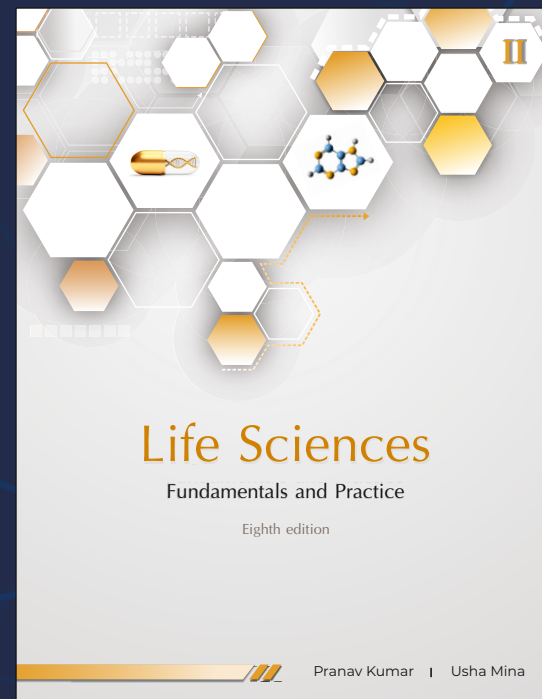
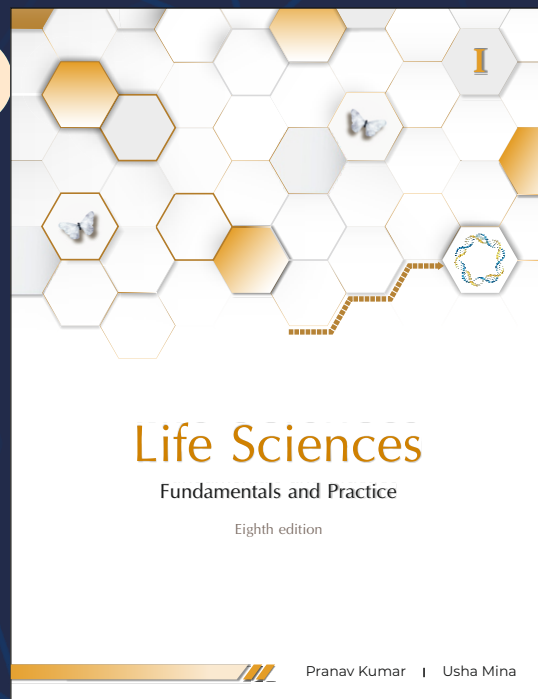
Q.43 The smallest positive (non-zero) integer “n” for which the expression $\left(\frac{1+i}{1-i}\right)^n = 1$ holds true, is _____.

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| Q.44 | Given that $A = (\sin\theta \cos\theta \tan\theta + \sin\theta \cos\theta \cot\theta)$, the value of A is |
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| Q.45 | An object is placed at the principal focus of a concave lens of focal length 10 cm. The image will be formed at _____ cm, between the optical center and the focus of the lens on the same side of the object. |
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| Q.46 | What is the maximum number of hydrogen bonds that a water molecule can make in the liquid state? |
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| Q.47 | How many pairs of autosomal chromosomes are there in normal humans? |
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| Section C: Q.51 – Q.60 Carry TWO marks each. | |
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| Q.51 | A man throws a ball vertically up in the air with an initial velocity v_1 such that it reaches a height of 12 m with a speed of 12 m/s. If he throws the same ball vertically up with an initial velocity v_2 such that it reaches a maximum height of 12 m. Calculate v_1/v_2 . (<i>up to 2 decimal places</i>) |
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| Q.52 | What is the acceleration due to gravity (m/s^2) on the surface of a planet if its radius is $1/4^{th}$ that of earth and its mass is $1/80^{th}$ that of earth? Assume that the gravity on the surface of the earth is $10 m/s^2$. |
| | |
| | |
| Q.53 | In a randomly mating population, the frequency of 'A' allele is 0.7. What is the frequency of 'Aa' genotype in the next generation according to Hardy-Weinberg's law? (<i>up to two decimal places</i>) |
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| Q.54 | The potential difference to accelerate an electron was quadrupled. By what factor does the <i>de Broglie</i> wavelength of the electron beam change? |

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| Q.55 | A 500 nm light is used for imaging in a confocal microscope. What will be the best resolution (in nm) of this microscope? |
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| Q.56 | Assuming the molecule shown below is aromatic, the value of “ n ” according to “Hückel’s rule” is  |
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| Q.57 | In an actively growing population from a single bacterium, 1,048,576 cells are present after 20 th generation. How many cells were there in 5 th generation? |
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| Q.58 | A double stranded DNA molecule of total 5000 base pairs long, has a melting temperature of 85 °C. What will be the % AT base pairs in this sample? (<i>up to one decimal place</i>). |
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| Q.59 | How many GTP molecules are required for the translocation of tRNA from P site to E site during translation elongation process in bacteria? |
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| Q.60 | Amongst the molecules given below, the total number of molecules that have at least one sp^2 hybridized atom is _____. C_6H_6 , NO_2 , BF_3 , H_2O_2 , SO_2 , C_2H_2 , <i>L</i> -Tryptophan |
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| Question No. | Question Type (QT) | Subject Name (SN) | Key/Range (KY) | Mark (MK) |
|---------------------|---------------------------|--------------------------|-----------------------|------------------|
| 1 | MCQ | BT | C | 1 |
| 2 | MCQ | BT | A | 1 |
| 3 | MCQ | BT | A | 1 |
| 4 | MCQ | BT | A | 1 |
| 5 | MCQ | BT | C | 1 |
| 6 | MCQ | BT | A | 1 |
| 7 | MCQ | BT | A | 1 |
| 8 | MCQ | BT | B | 1 |
| 9 | MCQ | BT | B | 1 |
| 10 | MCQ | BT | B | 1 |
| 11 | MCQ | BT | A | 2 |
| 12 | MCQ | BT | C | 2 |
| 13 | MCQ | BT | B | 2 |
| 14 | MCQ | BT | D | 2 |
| 15 | MCQ | BT | D | 2 |
| 16 | MCQ | BT | D | 2 |
| 17 | MCQ | BT | B | 2 |
| 18 | MCQ | BT | A | 2 |
| 19 | MCQ | BT | B | 2 |
| 20 | MCQ | BT | B | 2 |
| 21 | MCQ | BT | C | 2 |

| Question No. | Question Type (QT) | Subject Name (SN) | Key/Range (KY) | Mark (MK) |
|--------------|--------------------|-------------------|----------------|-----------|
| 22 | MCQ | BT | B | 2 |
| 23 | MCQ | BT | C | 2 |
| 24 | MCQ | BT | C | 2 |
| 25 | MCQ | BT | C | 2 |
| 26 | MCQ | BT | Marks to All | 2 |
| 27 | MCQ | BT | D | 2 |
| 28 | MCQ | BT | Marks to All | 2 |
| 29 | MCQ | BT | A | 2 |
| 30 | MCQ | BT | B | 2 |
| 31 | MSQ | BT | A,C | 2 |
| 32 | MSQ | BT | A,B,C | 2 |
| 33 | MSQ | BT | A,C | 2 |
| 34 | MSQ | BT | A,B,D | 2 |
| 35 | MSQ | BT | A,B,C | 2 |
| 36 | MSQ | BT | B,C,D | 2 |
| 37 | MSQ | BT | B,D | 2 |
| 38 | MSQ | BT | A,D | 2 |
| 39 | MSQ | BT | A,B | 2 |
| 40 | MSQ | BT | B,D or B,C,D | 2 |
| 41 | NAT | BT | 0.8 to 0.8 | 1 |
| 42 | NAT | BT | 21 | 1 |

| Question No. | Question Type (QT) | Subject Name (SN) | Key/Range (KY) | Mark (MK) |
|--------------|--------------------|-------------------|----------------|-----------|
| 43 | NAT | BT | 4 | 1 |
| 44 | NAT | BT | 1 | 1 |
| 45 | NAT | BT | -5 or 5 | 1 |
| 46 | NAT | BT | 4 | 1 |
| 47 | NAT | BT | 22 | 1 |
| 48 | NAT | BT | 1300 | 1 |
| 49 | NAT | BT | 3 | 1 |
| 50 | NAT | BT | 2 | 1 |
| 51 | NAT | BT | 1.25 to 1.30 | 2 |
| 52 | NAT | BT | 2 | 2 |
| 53 | NAT | BT | 0.41 to 0.43 | 2 |
| 54 | NAT | BT | 0.5 or 2 | 2 |
| 55 | NAT | BT | 180 to 250 | 2 |
| 56 | NAT | BT | 3 | 2 |
| 57 | NAT | BT | 32 | 2 |
| 58 | NAT | BT | 61.6 to 61.8 | 2 |
| 59 | NAT | BT | 1 | 2 |
| 60 | NAT | BT | 5 | 2 |