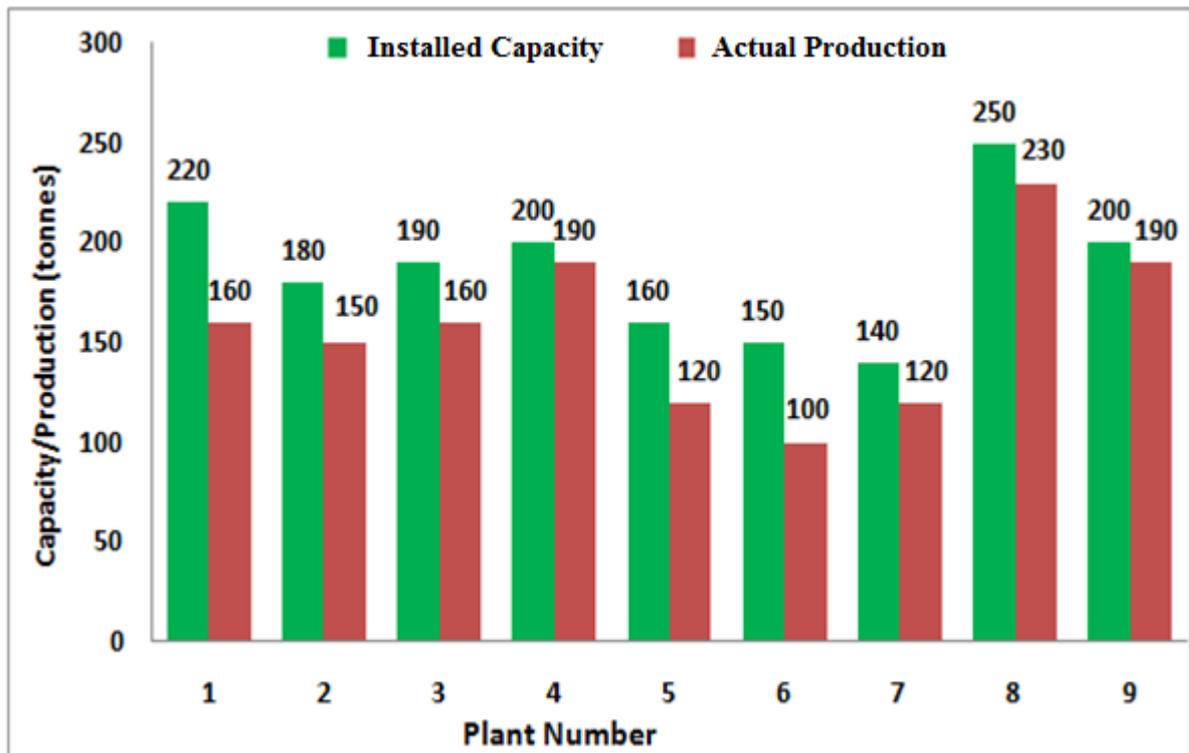


Q. 1 – Q. 5 carry one mark each.

- Q.1 The chairman requested the aggrieved shareholders to _____ him.
- (A) bare with (B) bore with (C) bear with (D) bare
- Q.2 Identify the correct spelling out of the given options:
- (A) Managable (B) Manageable (C) Mangaable (D) Managible
- Q.3 Pick the odd one out in the following:
- 13, 23, 33, 43, 53
- (A) 23 (B) 33 (C) 43 (D) 53
- Q.4 R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.
- Which of the following can be logically inferred from the above statements?
- (A) R2D2 is a robot which can only repair aeroplanes.
- (B) R2D2 is the only robot which can repair aeroplanes.
- (C) R2D2 is a robot which can repair only aeroplanes.
- (D) Only R2D2 is a robot.
- Q.5 If $|9y-6|=3$, then $y^2 - 4y/3$ is _____.
- (A) 0 (B) $+1/3$ (C) $-1/3$ (D) undefined

Q. 6 – Q. 10 carry two marks each.

- Q.6 The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is _____.



- Q.7 A poll of students appearing for masters in engineering indicated that 60 % of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99 % of such women were successful in their professions.

Which of the following can be logically inferred from the above paragraph?

- (A) Many students have misconceptions regarding various engineering disciplines.
- (B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers.
- (C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering.
- (D) The number of women pursuing higher degrees in mechanical engineering is small.

XL-K: MICROBIOLOGY**Q. 1 – Q. 10 carry one mark each.**

- Q.1 Which one of the following is the most appropriate technique to determine the relatedness of two bacterial species?
- (A) DNA hybridization (B) Doubling time measurement
(C) Biochemical characterization (D) Plasmid profiling
- Q.2 Which one of the following phages undergoes non-integrative lysogenic phase?
- (A) λ (B) P1 (C) T7 (D) M13
- Q.3 Which one of the following is **NOT** a part of human microbiome?
- (A) *Propionibacterium acnes* (B) *Lactobacillus casei*
(C) *Streptococcus suis* (D) *Bacteroides fragilis*
- Q.4 Resident macrophages of _____ are called Kupffer cells.
- (A) brain (B) liver (C) lung (D) kidney
- Q.5 The enzyme responsible for generation of hypochlorous ions during phagocytosis is
- (A) NADPH oxidase (B) catalase
(C) myeloperoxidase (D) superoxide dismutase
- Q.6 Teichoic acid is composed of repetitive units of
- (A) keto-deoxy octanoic acid (B) glucose
(C) *N*-acetyl glucosamine (D) glycerol
- Q.7 Biofilm produced by bacteria is detected by
- (A) Saffranin (B) Malachite green (C) Basic fuchsin (D) Congo red

- Q.8 The precursor for the synthesis of aromatic amino acids is
(A) phosphoenolpyruvate (B) pyruvate
(C) oxaloacetate (D) α -ketoglutarate
- Q.9 The net yield of NADH in the Embden-Meyerhof pathway in *E. coli* is_____.
- Q.10 *E. coli* ribonuclease contains 124 amino acids. The number of nucleotides present in the gene encoding the protein is _____.

Q. 11 – Q. 20 carry two marks each.

- Q.11 Which of the following infectious agents cross the blood-brain barrier?
(P) *Streptococcus pneumoniae* (Q) Coxsackie virus
(R) Rotavirus (S) *Streptococcus pyogenes*
(A) P & S (B) R & S (C) P & Q (D) Q & R
- Q.12 At $OD_{540nm} = 0.5$, which one of the following bacterial mono-dispersed cell suspensions will have (i) maximum and (ii) minimum number of cells?
(P) *Mycoplasma pneumoniae* (Q) *Micrococcus luteus*
(R) *Bacillus subtilis* (S) *Escherichia coli*
(A) P & Q (B) P & R (C) Q & R (D) R & S

Q.13 Which one of the following enzyme combinations allows some bacteria to utilize acetate through glyoxylate pathway?

- (P) Isocitrate lyase (Q) Isocitrate dehydrogenase
(R) Succinyl CoA synthetase (S) Malate synthase

- (A) P & S (B) P & R (C) Q & S (D) Q & R

Q.14 The decimal reduction time (D_{121}) for *Clostridium botulinum* spores is 0.2 min. The time required to reduce the spore count from 10^{12} to one spore at 121°C is _____ minutes.

Q.15 *E. coli* requires three genes, *galK* (kinase), *galT* (transacetylase) and *galE* (epimerase) to utilize galactose. If there is a mutation in any one of these genes, the mutant cannot utilize galactose. Which one of the following combinations of merodiploids will support the growth of mutants on galactose?

- (P) $galK^+ galT^+ galE^- / galK^- galT^+ galE^-$
(Q) $galK^- galT^+ galE^- / galK^+ galT^- galE^+$
(R) $galK^+ galT^- galE^- / galK^- galT^- galE^+$
(S) $galK^+ galT^+ galE^- / galK^+ galT^- galE^+$

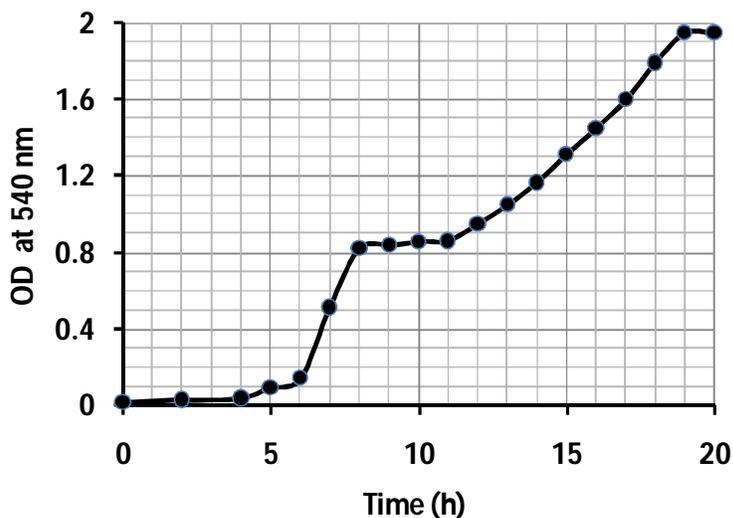
- (A) P & Q (B) P & R (C) R & S (D) Q & S

Q.16 Nitrogenase reduces N_2 to NH_3 . Metal co-factors required for this activity are _____.

- (A) Fe & Cu (B) Mo & Fe
(C) Mo & Mn (D) Cu & Mn

Q.17 If a bacterial cell contains 5,000 genes and if the average mutation frequency per gene is 2×10^{-4} per generation, the average number of new mutations per generation is _____.

- Q.18 The growth profile of *E. coli* on glucose plus lactose is shown below. The specific growth rate of the second exponential phase is ____ h⁻¹.



- Q.19 Match the cell structure components given in **Group I** with appropriate functions from **Group II**.

Group I

- (P) Cell membrane
(Q) Purple membrane
(R) Cisternae
(S) Outer membrane

Group II

- (I) Nutrient transport
(II) Photosynthesis
(III) Active transport
(IV) Protein glycosylation
(V) Light-driven proton transport

- (A) P-I, Q-V, R-II, S-III
(C) P-III, Q-II, R-V, S-I

- (B) P-I, Q-II, R-IV, S-III
(D) P-III, Q-V, R-IV, S-I

- Q.20 Match the antibiotics given in **Group I** with appropriate targets from **Group II**.

Group I

- (P) Nalidixic acid
(Q) Tetracycline
(R) Erythromycin
(S) Rifampin

Group II

- (I) RNA polymerase
(II) DNA gyrase
(III) DNA polymerase
(IV) 50S ribosomal subunit
(V) Aminoacyl tRNA

- (A) P-III, Q-IV, R-V, S-I
(C) P-II, Q-V, R-IV, S-I

- (B) P-V, Q-I, R-IV, S-II
(D) P-II, Q-V, R-I, S-IV

END OF THE QUESTION PAPER

Space for Rough Work

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