ASSIGNMENT 1: GATE 2011
BT: BIOTECHNOLOGY ENGINEERING

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2011 **BT : BIOTECHNOLOGY** **BT**

Duration: Three Hours *Maximum Marks: 100*

Read the following instructions carefully.

1) Write your name and registration number in the space provided at the bottom of this page.
2) Take out the Optical Response Sheet (ORS) from this Question Booklet **without breaking the seal**.
3) Do not open the seal of the Question Booklet until you are asked to do so by the invigilator.
4) Write your registration number, your name and name of the examination centre at the specified locations on the right half of the ORS. Also, using HB pencil, darken the appropriate bubble under each digit of your registration number and the letters corresponding to your test paper code (BT).
5) This Question Booklet contains **16 pages** including blank pages for rough work. After opening the seal at the specified time, please check all pages and report discrepancy, if any.
6) There are a total of 65 questions carrying 100 marks. All these questions are of objective type. Questions must be answered on the left hand side of the ORS by darkening the appropriate bubble (marked A, B, C, D) using HB pencil against the question number. For **each question darken the bubble of the correct answer**. In case you wish to change an answer, erase the old answer completely. More than one answer bubbled against a question will be treated as an incorrect response.
7) Questions Q.1 – Q.25 carry 1-mark each, and questions Q.26 – Q.55 carry 2-marks each.
8) Questions Q.48 – Q.51 (2 pairs) are common data questions and question pairs (Q.52, Q.53) and (Q.54, Q.55) are linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is unattempted, then the answer to the second question in the pair will not be evaluated.
9) Questions Q.56 – Q.65 belong to General Aptitude (GA). Questions Q.56 – Q.60 carry 1-mark each, and questions Q.61 – Q.65 carry 2-marks each. The GA questions begin on a fresh page starting from page 12.
10) Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE marks**. For Q.1 – Q.25 and Q.56 – Q.60, $\frac{1}{3}$ mark will be deducted for each wrong answer. For Q.26 – Q.51 and Q.61 – Q.65, $\frac{2}{3}$ mark will be deducted for each wrong answer. The question pairs (Q.52, Q.53) and (Q.54, Q.55) are questions with linked answers. There will be negative marks only for wrong answer to the first question of the linked answer question pair, i.e. for Q.52 and Q.54, $\frac{2}{3}$ mark will be deducted for each wrong answer. There is no negative marking for Q.53 and Q.55.
11) Calculator is allowed whereas charts, graph sheets or tables are **NOT** allowed in the examination hall.

12) Rough work can be done on the question paper itself. Additionally, blank pages are provided at the end of the question paper for rough work.

Name	
Registration Number	**BT**

Q.1 – Q.25 CARRY ONE MARK EACH

1) Embryonic stem cells are derived from

a) fertilized embryo
b) unfertilized embryo
c) sperm
d) kidney

(GATE BT 2011)

2) Members of the antibody protein family that have common structural features are collectively known as

a) haptens
b) allergens
c) antigens
d) immunoglobulins

(GATE BT 2011)

3) Apoptosis is characterized by

a) necrosis
b) programmed cell death
c) membrane leaky syndrome
d) cell cycle arrest process

(GATE BT 2011)

4) Yeast artificial chromosomes (YAC's) are used for cloning

a) large segments of DNA
b) mRNA
c) bacterial DNA
d) yeast DNA

(GATE BT 2011)

5) The product commercially produced by animal cell culture is

a) insulin
b) tissue plasminogen activator
c) interferon
d) hepatitis B vaccine

(GATE BT 2011)

6) An alternative to glycolysis pathway is

a) glyoxylate pathway
b) pentose phosphate pathway
c) citric acid cycle
d) gluconeogenesis

(GATE BT 2011)

7) A cell in G_1 of interphase has 12 chromosomes. How many chromatids will be found per cell during metaphase II of meiosis?

a) 6
b) 12
c) 18
d) 24

(GATE BT 2011)

8) Diploid *Drosophila* has eight chromosomes. Which one of the following terms should **NOT** be used to describe *Drosophila* with sixteen numbers of chromosomes?

a) Polyploid
b) Aneuploid
c) Euploid
d) Tetraploid

(GATE BT 2011)

9) Hydrated synthetic seeds which are produced by ion exchange reaction involve mixing the somatic embryos in a solution of

a) sodium alginate and dropping it in a solution of calcium nitrate
b) calcium alginate and dropping it in a solution of sodium nitrate
c) calcium alginate and dropping it in a solution of ammonium nitrate
d) mannitol and dropping it in a solution of sodium nitrate

(GATE BT 2011)

10) Shoot organogenesis by tissue culture results into

a) a bipolar structure that has no vascular connection with the explant
b) a monopolar structure that has a strong connection with the pre-existing vascular tissue of the explant
c) a monopolar structure that has no vascular connection with the explant
d) a bipolar structure that has a strong connection with the pre-existing vascular tissue of the explant

(GATE BT 2011)

11) 'Hairy roots' induced *in vitro* by the infection of *Agrobacterium rhizogenes*, are characterized by

P. a high degree of lateral branching
Q. genetic instability of culture
R. an absence of geotropism
S. poor biomass production

a) P and R only
b) P and Q only
c) Q and R only
d) R and S only

(GATE BT 2011)

12) In balanced growth phase of a cell

P. all components of a cell grow at the same rate

Q. specific growth determined by cell number or cell mass would be the same

R. the growth rate is independent of substrate concentration

S. the growth rate decreases with decreasing substrate concentration

a) P, Q and S only
b) Q, R and S only
c) P, Q and R only
d) P only

(GATE BT 2011)

13) In N-linked glycosylation, the oligosaccharide chain is attached to protein by

a) asparagine
b) arginine
c) serine
d) threonine

(GATE BT 2011)

14) Restriction endonucleases which recognize and cut same recognition sequences are known as

a) isoschizomers
b) isozymes
c) isoaccepting endonucleases
d) abzymes

(GATE BT 2011)

15) Substrate consumption in lag phase of microbial growth is primarily used for

P. turn over of the cell material

Q. maintenance of intracellular pH

R. motility

S. increase in cell number

a) P, Q and S only
b) Q, R and S only
c) P, Q and R only
d) S only

(GATE BT 2011)

16) Wash out (as defined by $D = D_{\max}$) of a continuous stirred tank fermenter is characterized by (X = biomass, S = substrate concentration in bioreactor, S_0 = substrate concentration in feed, P = product concentration in bioreactor)

a) $X = 0, S = 0, P = 0$

b) $X = 0, S = S_0, P = 0$

c) $X = 0, S < S_0, P = 0$

d) $X < 0, S < S_0, P < 0$

(GATE BT 2011)

17) The study of evolutionary relationships is known as

a) genomics

b) proteomics

c) phylogenetics

d) genetics

(GATE BT 2011)

18) The lipopolysaccharides present in bacterial cell wall has lipid A which is connected to

a) O-polysaccharide

b) core polysaccharide

c) both O-polysaccharide and core polysaccharide

d) rhamnose-mannose disaccharide

(GATE BT 2011)

19) Molecular chaperones are class of proteins that facilitate

a) the proper folding of newly synthesized proteins

b) unfolding of newly synthesized proteins

c) degradation of newly synthesized proteins

d) targeting of newly synthesized proteins

(GATE BT 2011)

20) Gas vacuoles are present in

a) *Anabaena flos-aquae*

b) *Bacillus subtilis*

c) *Acathamoeba nifrigiscens*

d) *Mycobacterium tuberculosis*

(GATE BT 2011)

21) In ABO blood group system, antigenic determinants are

a) nucleic acid

b) carbohydrate

c) lipid

d) protein

(GATE BT 2011)

22) The most widely used program for multiple sequence alignment is

a) BLAST
b) FASTA
c) CLUSTAL
d) Chime

(GATE BT 2011)

23) Diphtheria toxin, tetracycline and streptomycin inhibit

a) DNA repair
b) DNA replication
c) transcription
d) translation

(GATE BT 2011)

24) The polymorphic domains for Class II MHC proteins are

a) α_1 and β_1 domains only
b) β_1 and β_2 domains only
c) α_1 and β_2 domains only
d) α_2 and β_1 domains only

(GATE BT 2011)

25) The protein in eukaryotes which is subjected to degradation undergoes

a) phosphorylation
b) carboxylation
c) ubiquitination
d) methylation

(GATE BT 2011)

26) Match the viruses in Group I with their host cell receptors in Group II.

Group I	Group II
P. Hepatitis A virus	1. Heparan sulphate
Q. Human immunodeficiency virus	2. Acetylcholine receptor
R. Rabies virus	3. CD4 protein
S. Herpes simplex virus type I	4. Alpha-2 macroglobulin

a) P-1, Q-3, R-2, S-4
b) P-3, Q-4, R-1, S-2
c) P-4, Q-3, R-2, S-1
d) P-2, Q-3, R-1, S-4

(GATE BT 2011)

27) Match the microbial growth characteristics in **Group I** with the corresponding features in **Group II**.

Group I	**Group II**
P. Growth associated product formation	1. Specific growth rate decreases with increasing product concentration
Q. Non growth associated product formation	2. Specific product formation rate is constant
R. Product inhibition	3. Specific product formation rate is proportional to specific growth rate
S. Substrate inhibition	4. Specific growth rate decreases with increasing substrate concentration

a) $P \rightarrow 1,\ Q \rightarrow 2,\ R \rightarrow 4,\ S \rightarrow 3$

b) $P \rightarrow 3,\ Q \rightarrow 2,\ R \rightarrow 1,\ S \rightarrow 4$

c) $P \rightarrow 2,\ Q \rightarrow 1,\ R \rightarrow 3,\ S \rightarrow 4$

d) $P \rightarrow 2,\ Q \rightarrow 3,\ R \rightarrow 4,\ S \rightarrow 1$

(GATE BT 2011)

28) Match the items in **Group I** with **Group II**.

Group I	**Group II**
P. Circular dichroism	1. Concentration
Q. X-ray crystallography	2. Sedimentation coefficient
R. Freeze-drying	3. Secondary structure determination
S. Ultracentrifugation	4. Tertiary structure determination

(A) $P \rightarrow 4,\ Q \rightarrow 1,\ R \rightarrow 2,\ S \rightarrow 3$

(B) $P \rightarrow 1,\ Q \rightarrow 4,\ R \rightarrow 3,\ S \rightarrow 2$

(C) $P \rightarrow 2,\ Q \rightarrow 3,\ R \rightarrow 4,\ S \rightarrow 1$

(D) $P \rightarrow 3,\ Q \rightarrow 4,\ R \rightarrow 1,\ S \rightarrow 2$

(GATE BT 2011)

29) Match the products in Group I with their respective organisms in Group II.

Group I	**Group II**
P. Glycerol	1. Corynebacterium glutamicum
Q. Glutamic acid	2. Alcaligenes faecalis
R. Curdlan	3. Dunaliella salina
S. Actinomycin B	4. Streptomyces nodosus

a) P-2, Q-1, R-3, S-4

b) P-4, Q-2, R-1, S-3

c) P-3, Q-1, R-2, S-4

d) P-2, Q-1, R-4, S-3

(GATE BT 2011)

30) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r).

Assertion: I_gM is found in serum as a pentameric protein consisting of fiv I_gM monomers.

Reason: The pentameric form of I_gM is due to cross-linking of I_gM monomers via peptide bond.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

31) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r).

Assertion: N-methyl-N'-nitro-N-nitrosoguanidine (NTG) is an effective chemical mutagen.

Reason: Mutations induced by NTG mainly are the GC $\rightarrow$ AT transitions.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

32) Determine the correctness of the following statements

I. Enhancer sequences are those DNA sequences that are involved in increasing the rate of DNA replication.
II. Enhancer sequences work by binding with eukaryotic gene activator factors.

a) Only I is true
b) Only II is true
c) Both I and II are true
d) Both I and II are false

(GATE BT 2011)

33) In a well aerated and agitated microbial culture, the 'supply' of oxygen is equal to 'demand' (uptake) of the growing culture. The K_La for such a system will be
(K_La = volumetric mass transfer coefficient, C^* = dissolved oxygen concentration in liquid in equilibrium with gaseous oxygen, C = instantaneous value of dissolved oxygen concentration, r = specific oxygen uptake rate per unit weight of cells, X = dry weight of the cells per unit volume).

a) $(rX)/(C^* - C)$
b) $r/\{X(C^* - C)\}$
c) $(C^* - C)/(rX)$
d) $X/\{r(C^* - C)\}$

(GATE BT 2011)

34) Structured William's model

P. can describe the changes in intracellular components of the cell during growth
Q. can not describe the death phase of the cells
R. can describe the variation of size of cells in the different phases of growth
S. can not describe the lag period of growth

Which one of the following is **CORRECT**?

a) P, Q and S only
b) P, Q and R only
c) Q, R and S only
d) P, R and S only

(GATE BT 2011)

35) Match items in Group I with Group II.

Group I	**Group II**
P. Glycolytic pathway	1. Chloroplast
Q. Eukaryotic oxidative metabolism	2. Glyoxysomes
R. Glyoxylate cycle	3. Mitochondria
S. Calvin cycle	4. Cytosol

a) P-1, Q-2, R-3, S-4
b) P-2, Q-3, R-4, S-1
c) P-4, Q-3, R-2, S-1
d) P-3, Q-4, R-1, S-2

(GATE BT 2011)

36) Match items in Group I with Group II.

Group I	**Group II**
P. Alzheimer's disease	1. H1N1
Q. Mad cow disease	2. Hemoglobin
R. Sickle cell anaemia	3. Prions
S. Swine flu	4. Amyloid

a) P-4, Q-3, R-2, S-1

b) P-3, Q-4, R-1, S-2

c) P-2, Q-1, R-4, S-3

d) P-1, Q-2, R-3, S-4

(GATE BT 2011)

37) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r)
Assertion: The elucidation of ribosome structure helps in the development of new generation drugs.
Reason: The high resolution of macromolecular structure has enabled in structure-based drug design.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

38) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r)
Assertion: A very low amount of inhibitor can act as an activator for allosteric enzymes.
Reason: Allosteric enzymes follow Michaelis–Menten kinetics.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

39) Match the terms in Group I with their associated functions in Group II.

Group I	**Group II**
P. Shine–Dalgarno sequences	1. Aminoacylation of tRNA
Q. Leucine zipper	2. Gene silencing
R. Aminoacyl tRNA synthetase	3. Ribosome binding and facilitation of initiation
S. RNA interference (RNAi)	4. Transcription factors

a) P-3, Q-4, R-1, S-2

b) P-4, Q-3, R-2, S-1

c) P-2, Q-3, R-1, S-4

d) P-3, Q-2, R-4, S-1

(GATE BT 2011)

40) Protein–protein interactions are studied by

P. DNA foot printing

Q. Yeast two hybrid system

R. Ligation chain reaction

S. Mass spectrometry

a) P and S only
c) P and Q only
b) Q and S only
d) Q and R only

(GATE BT 2011)

41) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r)
Assertion: Isopropylthiogalactoside (IPTG) is a gratuitous inducer of lactose operon.
Reason: Gratuitous inducers are chemical analogues which behave like natural inducer but they do not serve as substrate for the enzymes that are subsequently induced.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

42) Determine the correctness or otherwise of the following Assertion (a) and the Reason (r)
Assertion: In synchronous culture, majority of the cells move to next phase of the cell cycle simultaneously.
Reason: Synchronous culture could be obtained by starving cells for essential nutrient components.

a) Both (a) and (r) are true and (r) is the correct reason for (a)

b) Both (a) and (r) are true but (r) is not the correct reason for (a)

c) (a) is true but (r) is false

d) (a) is false but (r) is true

(GATE BT 2011)

43) Which of the following characteristics with respect to bacterial DNA polymerase III are **TRUE**?

P. Initiation of chain synthesis

Q. $5' \rightarrow 3'$ polymerization

R. $3' \rightarrow 5'$ exonuclease activity

S. $5' \rightarrow 3'$ exonuclease activity

a) P and Q only
c) Q and S only
b) Q and R only
d) P and S only

(GATE BT 2011)

44) Maximum specific growth rate ($\mu_{\max}$) of a microorganism is calculated by taking the ln = $\log_e X$, X = biomass, t = time

a) slope of $\ln X$ vs t of the growth cycle

b) slope of $\ln X$ vs t during the exponential growth phase

c) slope of X vs t

d) slope of X vs t during the exponential phase of growth

(GATE BT 2011)

45) Identify the **CORRECT** statements

P. 5′ and 3′ ends of the transcripts can be mapped by utilizing polymerase chain reaction

Q. S_1 nuclease can cleave the DNA strand of a DNA-RNA hybrid

R. T_4 polynucleotide kinase is used for labeling 3′ end of DNA

S. Baculovirus *(Autographa californica)* can be used as an insect expression vector

a) P and Q only

b) R and S only

c) P and S only

d) Q and R only

(GATE BT 2011)

46) Value of the determinant mentioned below is

$$\begin{vmatrix} 1 & 0 & -1 & 0 \\ 4 & 7 & 0 & 2 \\ 1 & 1 & -1 & 1 \\ 2 & 0 & 2 & 1 \end{vmatrix}$$

a) 24 b) -30 c) -24 d) -10

(GATE BT 2011)

47) HAT (hypoxanthine, aminopterin and thymidine) is used for selecting the hybridomas based on the following

I. Only hybridoma will grow since it inherited the HGPRT genes from B-cells and can synthesize DNA from hypoxanthine.

II. Myeloma cells will not grow in cultures since *de novo* synthesis is blocked by aminopterin and due to the lack of HGPRT enzyme.

a) Only I is true

b) Only II is true

c) Both I and II are true

d) I is true and II is false

(GATE BT 2011)

Common Data Questions Common Data for Questions 48 and 49:

Red-green colour blindness is inherited as a recessive X-linked trait.

+

48) What will be the probability of having the colour-blind son to a woman with phenotypically normal parents and a colour-blind brother, and married to a normal man? (Assume that she has no previous children)

a) 100 % b) 50 % c) 25 % d) 12.5 %

(GATE BT 2011)

49) What will be the probability of having the colour-blind daughter to a phenotypically normal woman, who already had one colour-blind son, and is married to a colour-blind man?

a) 75 % b) 50 % c) 25 % d) 15 %

(GATE BT 2011)

Common Data for Questions 50 and 51:
A microorganism grows in a continuous 'chemostat' culture of 60 m^3 working volume with sucrose as the growth limiting nutrient at dilution rate, $D = 0.55\,h^{-1}$. The steady state biomass concentration is 4.5 Kg dry biomass m^{-3} and the residual sucrose concentration is 2.0 Kg m^{-3}. The sucrose concentration in the incoming feed medium is 10.0 Kg m^{-3}.

50) What would be the yield Y_{XS} (Kg biomass/Kg substrate)?

a) 0.562 b) 0.462 c) 0.362 d) 0.162

(GATE BT 2011)

51) What would be the sucrose concentration in the input feed for the output to be 45 Kg biomass h^{-1}?

a) 3.225 Kg m^{-3} b) 4.425 Kg m^{-3} c) 5.115 Kg m^{-3} d) 6.525 Kg m^{-3}

(GATE BT 2011)

Linked Answer Questions

Statement for Linked Answer Questions 52 and 53:
The abdomen length (in millimeters) was measured in 15 male fruit flies, and the following data were obtained:
1.9, 2.4, 2.1, 2.0, 2.2, 2.4, 1.7, 1.8, 2.0, 2.0, 2.3, 2.1, 1.6, 2.3 and 2.2

52) Variance (V_X) for this population of fruit flies as calculated from the above data shall be

a) 0.85 b) 0.25 c) 0.061 d) 0.08

(GATE BT 2011)

53) The value of standard deviation (SD) will be

a) 0.061 b) 0.25 c) 0.61 d) 0.85

(GATE BT 2011)

Linked Answer Questions

Statement for Linked Answer Questions 54 and 55:
A 200 μl of polymerase chain reaction has 100 template DNA molecules and the reaction was performed for 10 cycles.

54) How many molecules of amplicons will be generated?

a) 1.024×10^4 b) 1.024×10^5 c) 2.048×10^4 d) 2.048×10^5

(GATE BT 2011)

55) How many molecules of amplicons will be present in $0.1\,\mu l$ of reaction?

a) 102.4 b) 1024 c) 51.2 d) 512

(GATE BT 2011)

56) Which of the following options is the closest in the meaning to the word below: **Inexplicable**

a) Incomprehensible

b) Indelible

c) Incurable

d) Infallible

(GATE BT 2011)

57) Choose the word from the options given below that is most nearly opposite in meaning to the given word: **Amalgamate**

a) merge

b) split

c) collect

d) separate

(GATE BT 2011)

58) Choose the most appropriate word from the options given below to complete the following sentence. **If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or _____.**

a) hyperbolic

b) restrained

c) argumentative

d) indifferent

(GATE BT 2011)

59) Choose the most appropriate word(s) from the options given below to complete the following sentence. **I contemplated _____ Singapore for my vacation but decided against it.**

a) to visit

b) having to visit

c) visiting

d) for a visit

(GATE BT 2011)

60) If $\log(P/Q) = (1/2)\log(Q/R) = (1/3)\log(R)$, then which of the following options is TRUE?

a) $P^2 = QR^2$ b) $Q^3 = PR$ c) $Q^2 = R^3P$ d) $R = PQ^2$

(GATE BT 2011)

Q.61 to Q.65 carry two marks each.

61) **Few school curricula include a unit on how to deal with bereavement and grief, and yet all students at some point in their lives suffer from losses through death and parting.**

Based on the above passage which topic would **not** be included in a unit on bereavement?

a) how to write a letter of condolence

b) what emotional stages are passed through in the healing process

c) what the leading causes of death are

d) how to give support to a grieving friend

(GATE BT 2011)

62) A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?

a) 7.58 litres b) 7.84 litres c) 7 litres d) 7.29 litres

(GATE BT 2011)

63) A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the orders. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?

a) 4 b) 5 c) 6 d) 7

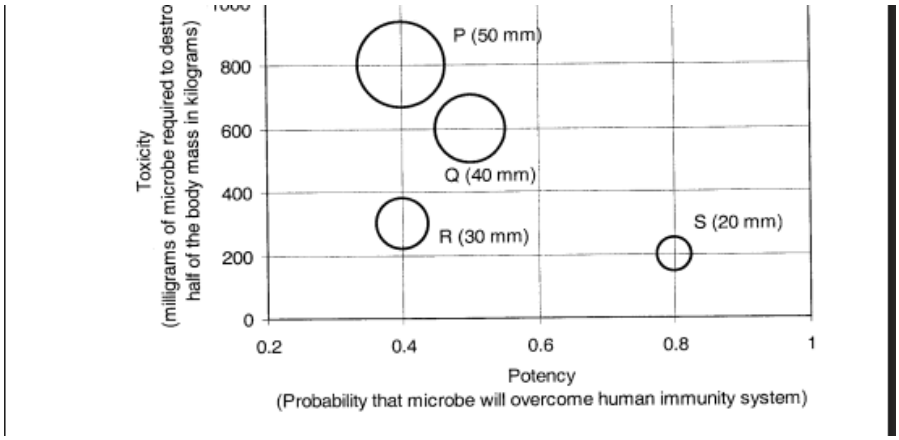
(GATE BT 2011)

64) The variable cost (V) of manufacturing a product varies according to the equation $V = 4q$, where q is the quantity produced. The fixed cost (F) of production of the same product reduces with q according to the equation $F = \frac{100}{q}$. How many units should be produced to minimize the total cost ($V + F$)?

a) 5 b) 4 c) 7 d) 6

(GATE BT 2011)

65) P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving the human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below:



A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

a) P b) Q c) R d) S

(GATE BT 2011)