



GATE XL Previous Year Solved Question Papers

**G.A.T.E. (XL) 2015**

**Life Sciences**

**Examination**

*(Original Question Paper with Answer Key)*

**GRADUATE APTITUDE TEST IN ENGINEERING**



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# I tcf wcv'Cr vkwf g'Vguv'kp'Gpi kpggt kpi

## P qv'kpu'k

- Options shown in green color and with ✓ icon are correct.
- Options shown in red color and with ✗ icon are incorrect.

S wguv'kpp'Rcr gt'P co g<

ZN<NHG'UEIGP EGU'53w'Lcp'Uj kh3

P wo dgt 'qh'S wguv'kpu<

347

Vqcr'O ct m<

3220

Wrong answer for MCQ will result in negative marks, (-1/3) for 1 mark Questions and (-2/3) for 2 marks Questions.

## General Aptitude

P wo dgt 'qh'S wguv'kpu<

32

Uge'kpp'O ct m<

370

Q.1 to Q.5 carry 1 mark each & Q.6 to Q.10 carry 2 marks each.

S wguv'kpp'P wo dgt '23''S wguv'kpp'V{ r g'kO ES

Choose the most appropriate word from the options given below to complete the following sentence.

The principal presented the chief guest with a \_\_\_\_\_, as token of appreciation.

- (A) momento (B) memento (C) momentum (D) moment

Qr'v'kpu'k

- ✗ A
- ✓ B
- ✗ C
- ✗ D

S wguv'kpp'P wo dgt '24''S wguv'kpp'V{ r g'kO ES

Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:

Frogs \_\_\_\_\_.

- (A) croak (B) roar (C) hiss (D) patter

Qr'v'kpu'k

- ✓ A
- ✗ B
- ✗ C
- ✗ D

S wguv'kpp'P wo dgt '25''S wguv'kpp'V{ r g'kO ES

Choose the word most similar in meaning to the given word:

Educe

- (A) Exert                      (B) Educate                      (C) Extract                      (D) Extend

Qr v kpu'<

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

S wgnkqp'P wo dgt '26" S wgnkqp'V{ r g'<O ES

Operators  $\square$ ,  $\diamond$  and  $\rightarrow$  are defined by:  $a \square b = \frac{a-b}{a+b}$ ;  $a \diamond b = \frac{a+b}{a-b}$ ;  $a \rightarrow b = ab$ .

Find the value of  $(66 \square 6) \rightarrow (66 \diamond 6)$ .

- (A) -2                      (B) -1                      (C) 1                      (D) 2

Qr v kpu'<

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

S wgnkqp'P wo dgt '27" S wgnkqp'V{ r g'<O ES

If  $\log_x (5/7) = -1/3$ , then the value of x is

- (A) 343/125  
(B) 125/343  
(C) -25/49  
(D) -49/25

Qr v kpu'<

1. ✔ A  
2. ✘ B  
3. ✘ C  
4. ✘ D

S wgnkqp'P wo dgt '28" S wgnkqp'V{ r g'<O ES

The following question presents a sentence, part of which is underlined. Beneath the sentence you find four ways of phrasing the underlined part. Following the requirements of the standard written English, select the answer that produces the most effective sentence.

Tuberculosis, together with its effects, ranks one of the leading causes of death in India.

- (A) ranks as one of the leading causes of death  
(B) rank as one of the leading causes of death  
(C) has the rank of one of the leading causes of death  
(D) are one of the leading causes of death

Qr vqpu'<

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

S vgnkqp'Pwo dgt '29''S vgnkqp'V{ r g'2O ES

Read the following paragraph and choose the correct statement.

Climate change has reduced human security and threatened human well being. An ignored reality of human progress is that human security largely depends upon environmental security. But on the contrary, human progress seems contradictory to environmental security. To keep up both at the required level is a challenge to be addressed by one and all. One of the ways to curb the climate change may be suitable scientific innovations, while the other may be the Gandhian perspective on small scale progress with focus on sustainability.

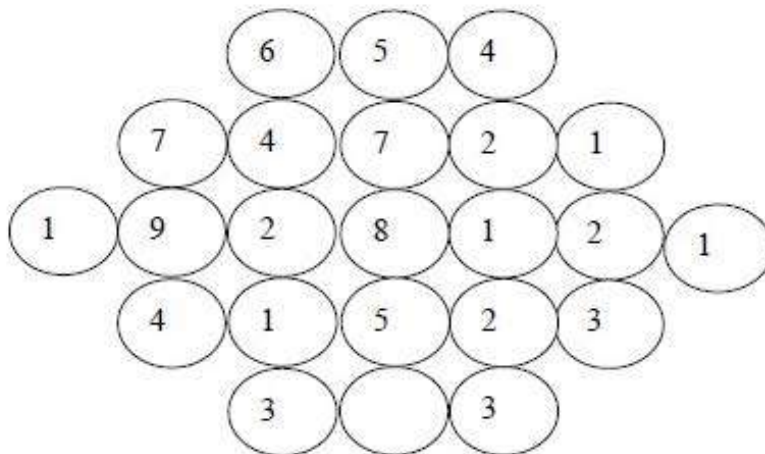
- (A) Human progress and security are positively associated with environmental security.
- (B) Human progress is contradictory to environmental security.
- (C) Human security is contradictory to environmental security.
- (D) Human progress depends upon environmental security.

Qr vqpu'<

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

S vgnkqp'Pwo dgt '2: ''S vgnkqp'V{ r g'2P CV

Fill in the missing value



Eqtt gev' Cpuy gt '<

5

S vgnkqp'Pwo dgt '2; ''S vgnkqp'V{ r g'2O ES

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A cube of side 3 units is formed using a set of smaller cubes of side 1 unit. Find the proportion of the number of faces of the smaller cubes visible to those which are NOT visible.

- (A) 1 : 4                      (B) 1 : 3                      (C) 1 : 2                      (D) 2 : 3

Qr v!kpu'<

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

S wgunqp'Pwo dgt '232''S wgunqp'V{ r g'2O ES

Humpty Dumpty sits on a wall every day while having lunch. The wall sometimes breaks. A person sitting on the wall falls if the wall breaks.

Which one of the statements below is logically valid and can be inferred from the above sentences?

- (A) Humpty Dumpty always falls while having lunch  
(B) Humpty Dumpty does not fall sometimes while having lunch  
(C) Humpty Dumpty never falls during dinner  
(D) When Humpty Dumpty does not sit on the wall, the wall does not break

Qr v!kpu'<

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

Chemistry

P wo dgt 'qh'S wgunqp'<

37

Ugevkp'O ctm<

470

Q.11 to Q.35 carry 1 mark each & Q.36 to Q.65 carry 2 marks each.

S wgunqp'Pwo dgt '233''S wgunqp'V{ r g'2O ES

The molecule having net 'non-zero dipole moment' is

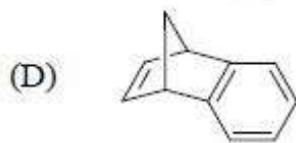
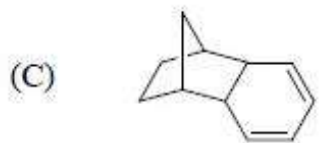
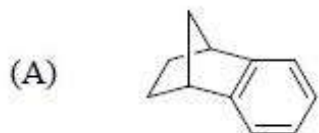
- (A)  $\text{CCl}_4$                       (B)  $\text{NF}_3$                       (C)  $\text{CO}_2$                       (D)  $\text{BCl}_3$

Qr v!kpu'<

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

S wgunqp'Pwo dgt '234''S wgunqp'V{ r g'2O ES

The Diels-Alder adduct from the reaction between cyclopentadiene and benzyne is



Or skip

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Sample Question 35

The number of possible enantiomeric pair(s) in  $\text{HOOC}-\text{CH}(\text{OH})-\text{CH}(\text{OH})-\text{COOH}$  is \_\_\_\_\_

Equation

3

Sample Question 36

For the electrochemical reaction,  $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightleftharpoons \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$

the equilibrium constant at  $25^\circ\text{C}$  is  $1.7 \times 10^{37}$ . The change in standard Gibbs free energy ( $\Delta G^\circ$ ) for this reaction at that temperature will be \_\_\_\_\_  $\text{kJ mol}^{-1}$  (up to one decimal place).

(Given:  $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$ )

Equation

/43408/v/43408

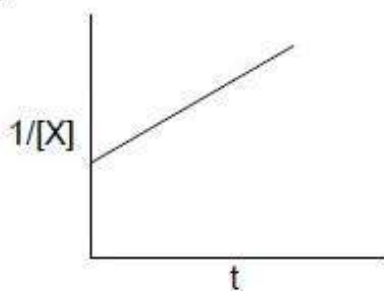
Sample Question 37

Among the following diagrams, the one that correctly describes a zero order reaction

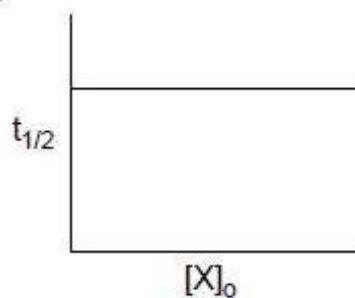
( $X \rightarrow \text{product}$ ) is

(Given:  $[X]_0$  = initial concentration of reactant X;  $[X]$  = concentration of reactant X at time  $t$  and  $t_{1/2}$  = half-life period of reactant X)

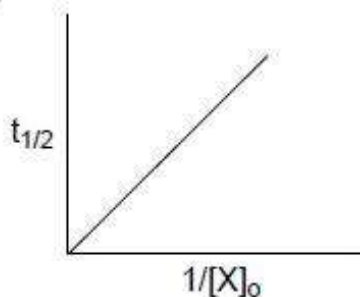
(A)



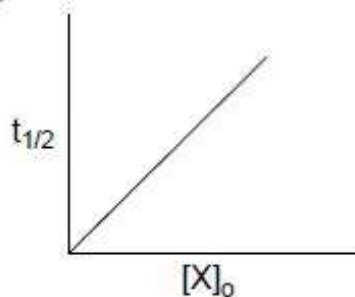
(B)



(C)



(D)



Qr vqpu<

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

S vguvkp'P wo dgt '238''S vguvkp'V{rg}'2O ES

If the radius of first Bohr orbit is  $0.53 \text{ \AA}$ , then the radius of the third Bohr orbit is

- (A)  $2.12 \text{ \AA}$       (B)  $4.77 \text{ \AA}$       (C)  $1.59 \text{ \AA}$       (D)  $3.18 \text{ \AA}$

Qr vqpu<

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

S vguvkp'P wo dgt '239''S vguvkp'V{rg}'2PCV

If  $50 \text{ mL}$  of  $0.02 \text{ M HCl}$  is added to  $950 \text{ mL}$  of  $\text{H}_2\text{O}$ , then the pH of the final solution will be \_\_\_\_\_

Eq t gev' Cpuy gt <



Sample Question 3: Stability of [CrCl<sub>6</sub>]<sup>3-</sup> (X), [MnCl<sub>6</sub>]<sup>3-</sup> (Y) and [FeCl<sub>6</sub>]<sup>3-</sup> (Z) follows the order

(Given: Atomic numbers of Cr = 24, Mn = 25 and Fe = 26)

- (A) X > Y > Z      (B) X < Y < Z      (C) Y < X < Z      (D) X < Y = Z

Correct Answer:

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Sample Question 3: Stability of [CrCl<sub>6</sub>]<sup>3-</sup> (X), [MnCl<sub>6</sub>]<sup>3-</sup> (Y) and [FeCl<sub>6</sub>]<sup>3-</sup> (Z) follows the order

Among the following pairs, the paramagnetic and diamagnetic species, respectively, are

- (A) CO and O<sub>2</sub><sup>-</sup>      (B) NO and CO      (C) O<sub>2</sub><sup>2-</sup> and CO      (D) NO<sup>+</sup> and O<sub>2</sub><sup>-</sup>

Correct Answer:

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Sample Question 42: Stability of [CrCl<sub>6</sub>]<sup>3-</sup> (X), [MnCl<sub>6</sub>]<sup>3-</sup> (Y) and [FeCl<sub>6</sub>]<sup>3-</sup> (Z) follows the order

In compounds K<sub>4</sub>[Fe(CN)<sub>6</sub>] (P) and Fe(CO)<sub>5</sub> (Q), the iron metal centre is bonded to

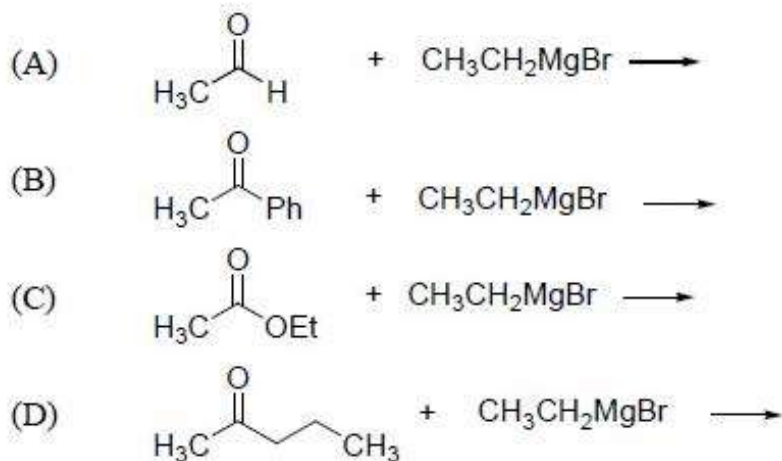
- (A) C of CN<sup>-</sup> in P and C of CO in Q  
 (B) N of CN<sup>-</sup> in P and C of CO in Q  
 (C) C of CN<sup>-</sup> in P and O of CO in Q  
 (D) N of CN<sup>-</sup> in P and O of CO in Q

Correct Answer:

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Sample Question 43: Stability of [CrCl<sub>6</sub>]<sup>3-</sup> (X), [MnCl<sub>6</sub>]<sup>3-</sup> (Y) and [FeCl<sub>6</sub>]<sup>3-</sup> (Z) follows the order

Among the following reactions, the one that produces achiral alcohol (after hydrolysis) is

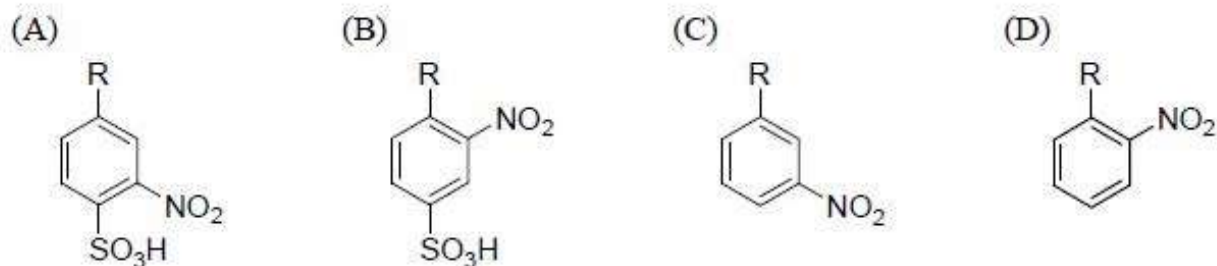
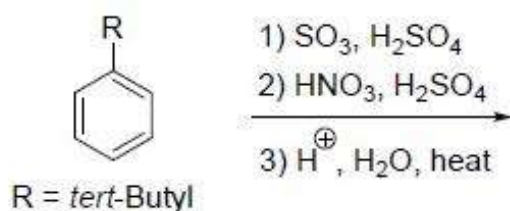


Qr v̇kpu'<

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

S ẇṁk̇p'P wo dgt '24'S ẇṁk̇p'V{rg'2O ES

The major product from the following reaction is

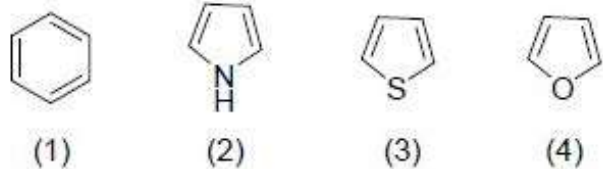


Qr v̇kpu'<

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

S ẇṁk̇p'P wo dgt '25'S ẇṁk̇p'V{rg'2O ES

The order of resonance energy for the following molecules is



(A) (1) > (3) > (2) > (4)

(B) (1) > (3) > (4) > (2)

(C) (1) > (4) > (2) > (3)

(D) (1) > (4) > (3) > (2)

Qr v'kpu'<

1. ✓ A

2. ✗ B

3. ✗ C

4. ✗ D

S w'gukqp'P wo dgt '246''S w'gukqp'V{rg}'2PCV

The molar enthalpy of vaporization for a liquid (normal boiling point = 78.3 °C) is 39 kJ mol<sup>-1</sup>. If the liquid has to boil at 25 °C, the pressure must be reduced to \_\_\_\_\_ Torr (up to one decimal place).

(Given: R = 8.314 JK<sup>-1</sup>mol<sup>-1</sup>; 1 atm = 760 Torr)

Eqtt gev' Cpuy gt '<

8; 8'vq'920

S w'gukqp'P wo dgt '247''S w'gukqp'V{rg}'2OES

For the process, H<sub>2</sub>O(l) ⇌ H<sub>2</sub>O(s) at 0 °C and 1 atm, the correct statement is

(A) ΔS<sub>system</sub> = 0

(B) ΔS<sub>total</sub> > 0

(C) ΔS<sub>total</sub> = 0

(D) ΔS<sub>total</sub> < 0

Qr v'kpu'<

1. ✗ A

2. ✗ B

3. ✓ C

4. ✗ D

Biochemistry

P wo dgt 'qhi'S w'gukqp'<

42

Uge'v'kqp'O ctmu'<

520

Question 48: Which one of the following small molecules is a prerequisite for fatty acid oxidation?

Which one of the following small molecules is a prerequisite for fatty acid oxidation?

- (A) Inositol                      (B) Choline                      (C) Carnitine                      (D) Glycerol

Correct Answer:

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question 49: Which one of the following bases is NOT found in the T-arm of an aminoacyl t-RNA?

Which one of the following bases is NOT found in the T-arm of an aminoacyl t-RNA?

- (A) Dihydrouridine  
(B) Pseudouridine  
(C) Uracil  
(D) Guanine

Correct Answer:

1. ✔ A  
2. ✘ B  
3. ✘ C  
4. ✘ D

Question 50: Oxidation of one molecule of glucose via the glycerol-phosphate shuttle produces

Oxidation of one molecule of glucose via the glycerol-phosphate shuttle produces

- (A) 32 molecules of ATP                      (B) 32 molecules of NADPH  
(C) 30 molecules of ATP                      (D) 30 molecules of NADPH

Correct Answer:

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question 51: Ribulose-5-phosphate epimerase is involved in which one of the following processes?

Ribulose-5-phosphate epimerase is involved in which one of the following processes?

- (A) Glycolysis  
(B) TCA cycle  
(C) Glycosylation  
(D) Pentose phosphate pathway

Correct Answer:

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Question 52: Which one of the following small molecules is a prerequisite for fatty acid oxidation?

Proteolytic enzymes are usually biosynthesized as large, inactive precursors known as

- (A) holoenzymes (B) ribozyme  
(C) zymogens (D) apoenzymes

Qr v kpu'<

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

S wgu kqp'P wo dgt '253'S wgu kqp'V{rg'2O ES

The formation of a carbocation, also called an oxonium ion, occurs during the reaction catalyzed by

- (A) aldolase (B) lysozyme (C) ribonuclease A (D) carboxypeptidase

Qr v kpu'<

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

S wgu kqp'P wo dgt '254'S wgu kqp'V{rg'2O ES

Which one of the following amino acid substitutions is likely to cause the largest change in protein conformation?

- (A) Phe → Ile (B) Ser → Thr (C) Gln → Tyr (D) Glu → Val

Qr v kpu'<

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

S wgu kqp'P wo dgt '255'S wgu kqp'V{rg'2O ES

Which one of the following does NOT constitute the lipid moiety in lipid-linked membrane proteins?

- (A) Palmitic acid (B) Stearic acid  
(C) Farnesyl groups (D) Myristic acid

Qr v kpu'<

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

S wgu kqp'P wo dgt '256'S wgu kqp'V{rg'2PCV

A closed circular B-DNA of 4000 base pairs is negatively supercoiled by introduction of 4 writhes. The super helical density of the resultant DNA molecule will be \_\_\_\_\_

Equit gev' Cpuy gt ' <

/2023

S wgnkqp' Pwo dgt ' <57'' S wgnkqp' V{ r g' <O ES

Which one of the following is **NOT** a receptor tyrosine kinase?

- (A) Platelet derived growth factor receptor
- (B) Insulin like growth factor - 1 receptor
- (C) Macrophage colony stimulating factor receptor
- (D) Transforming growth factor  $\beta$  receptor

Qr v kpu' <

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

S wgnkqp' Pwo dgt ' <58'' S wgnkqp' V{ r g' <O ES

Match the entries in Column-1 with those in Column-2

Column-1

- P. Vitamin B1
- Q. Carboxypeptidase
- R. TCA cycle
- S. Reducing sugar

Column-2

- 1. Thiamine pyrophosphate
- 2. Aconitase
- 3. Sucrose
- 4.  $Zn^{2+}$
- 5. Riboflavin
- 6. Lactose

- (A) P-1; Q-4; R-2; S-6
- (B) P-5; Q-1; R-2; S-3
- (C) P-1; Q-4; R-5; S-6
- (D) P-5; Q-2; R-1; S-6

Qr v kpu' <

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

S wgnkqp' Pwo dgt ' <59'' S wgnkqp' V{ r g' <O ES

The following table provides information about four proteins.

Protein	Native mol. wt. (Da)	pI	Type
P	32000	6.4	monomer
Q	40000	8.5	homodimer
R	25000	4.9	monomer
S	45000	8.5	homotrimer

Which one of the following options correctly identifies the order of elution in size exclusion chromatography and the increasing order of mobility in SDS polyacrylamide gel?

- (A) Chromatography: SQPR; Electrophoresis: RPQS  
 (B) Chromatography: RPQS; Electrophoresis: SQPR  
 (C) Chromatography: PRQS; Electrophoresis: PRQS  
 (D) Chromatography: SQPR; Electrophoresis: PRQS

Or vkpu'<

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

S wgnkqp'P wo dgt '25: "S wgnkqp'V{rg'2PCV

The predicted molar extinction coefficient at 280 nm for the peptide GEEFHISFLIMFGAWSTHMYRTYWFIHEMISTRY is \_\_\_\_\_  $M^{-1}cm^{-1}$ .

[Molar extinction coefficients for phenylalanine, tryptophan and tyrosine at 280 nm are 200, 5600 and 1400  $M^{-1}cm^{-1}$ , respectively]

Eqtt gev' Cpuy gt <

38422

S wgnkqp'P wo dgt '25: "S wgnkqp'V{rg'2OES

Match the contents of Column I with the most appropriate options in Column II

Column I

- P. Complement C1q  
 Q. L-Selectin  
 R. Membrane Attack Complex  
 S. T-Helper cells

Column II

- i. CD34  
 ii. Complement C5b  
 iii. Fc region of antibody  
 iv. Complement C5a  
 v. CD40L

- (A) P-iii ; Q-v ; R-iv ; S-i  
 (B) P-i ; Q-ii ; R-iv ; S-v  
 (C) P-iii ; Q-i ; R-ii ; S-v  
 (D) P-iv ; Q-v ; R-ii ; S-i

Or vkpu'<

1. ✘ A
2. ✘ B

3. ✓ C

4. ✗ D

S vgnkqp'P wo dgt '262'S vgnkqp'V{rg'2PCV

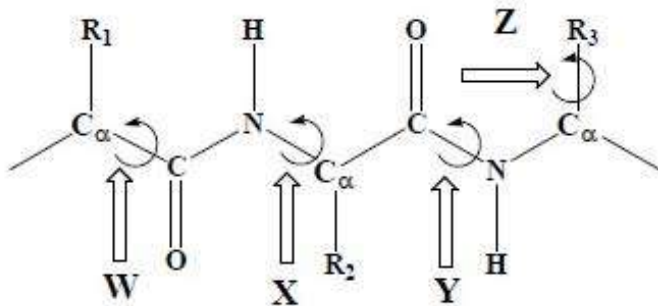
The value of  $\Delta G$  at  $37^\circ\text{C}$  for the movement of  $\text{Ca}^{2+}$  ions from the endoplasmic reticulum where  $[\text{Ca}^{2+}]$  is  $1\text{ mM}$  to the cytosol where  $[\text{Ca}^{2+}]$  is  $0.1\ \mu\text{M}$  at  $-50\text{ mV}$  membrane potential is \_\_\_\_\_  $\text{kJ mol}^{-1}$ .

[  $R = 8.314\ \text{JK}^{-1}\text{mol}^{-1}$  and  $1\ \text{Faraday} = 96500\ \text{Coulombs}$  ]

Eq t gev' Cpuy gt '2

/56'vq'/55

S vgnkqp'P wo dgt '263'S vgnkqp'V{rg'2OES



Column I	Column II
W	i. $\psi$
X	ii. $\chi$
Y	iii. $\phi$
Z	iv. $\omega$

Which of the following identifies the correctly matched pairs?

- (A) W-iii ; X-i ; Y-iv ; Z-ii
- (B) W-i ; X-iii ; Y-iv ; Z-ii
- (C) W-i ; X-iii ; Y-ii ; Z-iv
- (D) W-iii ; X-i ; Y-ii ; Z-iv

Qr vknpu'2

1. ✗ A

2. ✓ B

3. ✗ C

4. ✗ D

S vgnkqp'P wo dgt '264'S vgnkqp'V{rg'2OES



Which of the following statements is/are **INCORRECT** about hemoglobin (Hb)?

- I Hb demonstrates higher oxygen carrying capacity compared to myoglobin
- II There is covalent bonding between the four subunits of Hb
- III During deoxygenation the loss of the first oxygen molecule from oxygenated Hb promotes the dissociation of oxygen from the other subunits

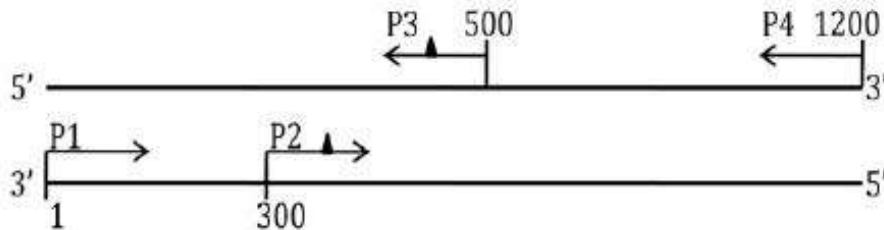
- (A) II                      (B) II & III                      (C) I & III                      (D) III

Or skip <

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Skip >

A 1.2 kb DNA fragment was used as a template for PCR amplification using primers P1, P2, P3 and P4 as shown in the scheme below. The annealing positions of primers on the template are indicated by numbers. Primers P2 and P3 contain single base mismatches as indicated by filled triangles.



PCR was performed using primer pair P1 and P3 in one vial and P2 and P4 in another vial. The purified PCR products from the two vials were mixed and subjected to another round of PCR with primers P1 and P4. The final PCR product will correspond to a

- (A) 1.2 kb wild type DNA
- (B) 1.2 kb DNA with two point mutations
- (C) 0.9 kb DNA with one point mutation
- (D) 0.5 kb DNA with one point mutation

Or skip <

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Skip >

A cell suspension was subjected to membrane disruption followed by differential centrifugation to fractionate the cellular components.

Match the centrifugal conditions in Column I to the appropriate subcellular components in Column II.

Column I

- P. 1000 g, 10 min
- Q. 20000 g, 30 min
- R. 80000 g, 1 hour
- S. 150000 g, 3 hours

Column II

- i. Microsomes and small vesicles
- ii. Ribosomes
- iii. Nuclei
- iv. Lysosomes and peroxisomes

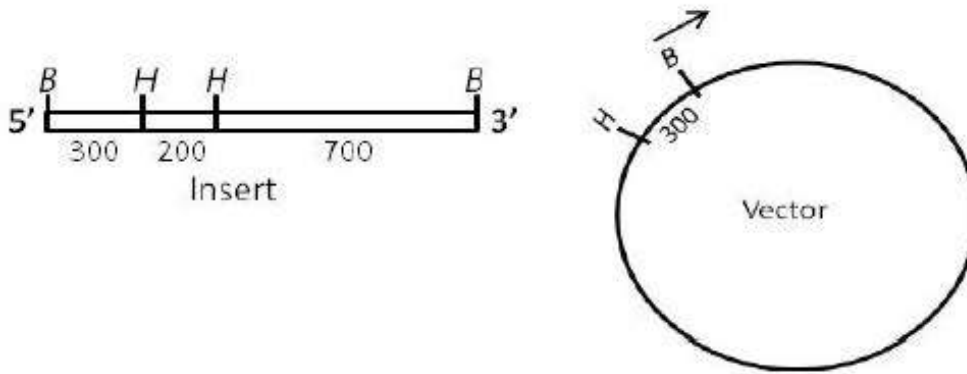
- (A) P-iii ; Q-iv ; R-i ; S-ii
- (B) P-i ; Q-iv ; R-iii ; S-ii
- (C) P-iii ; Q-iv ; R-ii ; S-i
- (D) P-ii ; Q-i ; R-iv ; S-iii

Or vkpu'<

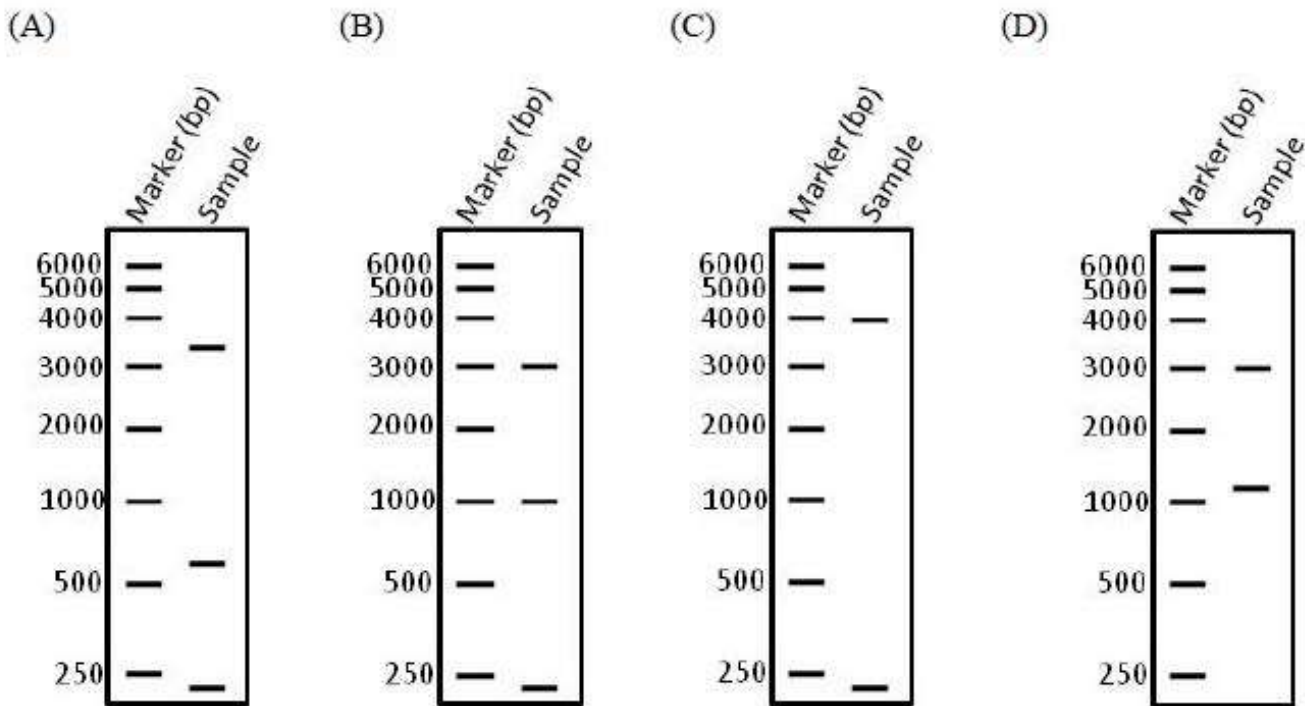
- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

S vgu'kqp'P wo dgt '267''S vgu'kqp'V{rg'2O ES

Given below are the maps of a 1200 base pairs (bp) long DNA insert and a 3000 bp expression vector. The *Bam*HI (*B*) and *Hind*III (*H*) restriction sites and DNA length between them are indicated in base pairs.



The insert is cloned into the vector at the *Bam*HI site and the desired orientation is shown by the arrow. After cloning, the orientation of the insert in the recombinant plasmid is tested by complete *Hind*III digestion followed by agarose gel electrophoresis. Which one of the following band patterns reveals the correct orientation of the insert in the construct?



Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Botany

Number of Questions:

20

Section Marks:

30.0

Question Number : 46 Question Type : MCQ

Nuclear membrane is absent in

- (A) *Chlamydomonas*
- (B) *Nostoc*
- (C) *Volvox*
- (D) *Chlorella*

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 47 Question Type : MCQ

An organized and differentiated cell having cytoplasm but no nucleus is found in

- (A) Companion cell
- (B) Xylem parenchyma
- (C) Sieve tube element
- (D) Phloem parenchyma

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 48 Question Type : MCQ

Double haploids in plants can be induced by

- (A) Mitomycin-C
- (B) Mirin
- (C) Colchicine
- (D) 5-Azacytidine

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 49 Question Type : MCQ

During fatty acid biosynthesis, the first intermediate malonyl-CoA is formed from

- (A) Acetyl-CoA and bicarbonate
- (B) Two acetyl-CoA molecules
- (C) Acetyl-CoA and biotin
- (D) Palmitoyl CoA and acyl-carrier protein (ACP)

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 50 Question Type : MCQ

Which of the following techniques is NOT applicable for evaluating the expression of a transgene?

- (A) Northern blot
- (B) RT-PCR
- (C) Western blot
- (D) Southern blot

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 51 Question Type : MCQ

Identify the CORRECT family possessing the following characters: presence of glucosinolates, tetradynamous stamens, superior ovary with parietal placentation and silique type fruit

- (A) Brassicaceae
- (B) Capparidaceae
- (C) Fumariaceae
- (D) Papavaraceae

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 52 Question Type : MCQ

Which of the following reduces the transpiration rate when applied to aerial parts of plants?

- (A) Phosphon-D
- (B) Paraquat
- (C) Phenyl mercuric acetate
- (D) Valinomycin

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 53 Question Type : MCQ

A tube like membrane structure that forms the connection between the endoplasmic reticulum of neighboring cells through plasmodesmata is

- (A) Desmotubule
- (B) Desmosome
- (C) Dictyosome
- (D) Microtubule

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 54 Question Type : MCQ

Which one of the followings is NOT a cryoprotectant for plant tissue?

- (A) Dimethyl sulfoxide
- (B) Glycerol
- (C) Ethylene glycol
- (D) Liquid nitrogen

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 55 Question Type : MCQ

Two similar holotypes are called

- (A) Monotype
- (B) Neotype
- (C) Isotype
- (D) Syntype

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 56 Question Type : MCQ

A cross was made between AABBCCDDEE and aabbccdde. The resultants  $F_1$  were selfed. Applying Mendelian principle, PREDICT the proportion of phenotype showing all the recessive characters in  $F_2$  generation.

- (A)  $\frac{1}{64}$
- (B)  $\frac{1}{256}$
- (C)  $\frac{1}{512}$
- (D)  $\frac{1}{1024}$

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 57 Question Type : MCQ

Identify the CORRECT statements with respect to functioning of ecosystem.

- P. A food chain is a series of organisms, each one feeding on the organism succeeding it
- Q. Food web presents a complete picture of the feeding relationships in any given ecosystem
- R. In ecosystem, energy flows in unidirectional way, whereas nutrients flow in cyclic fashion
- S. In biogeochemical cycles, nutrients do not alternate between organisms and environment

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

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 58 Question Type : MCQ

Match the name of the diseases with their causal organisms.

Disease	Causal Organism
P. Loose smut of wheat	1. <i>Cercospora personata</i>
Q. Wart disease of potato	2. <i>Alternaria solani</i>
R. Panama disease of banana	3. <i>Synchytrium endobioticum</i>
S. Tikka disease of groundnut	4. <i>Ustilago tritici</i>
	5. <i>Fusarium oxysporum</i>
	6. <i>Erwinia amylovora</i>

- (A) P-6, Q-4, R-3, S-2  
(C) P-4, Q-3, R-5, S-1

- (B) P-4, Q-6, R-1, S-3  
(D) P-2, Q-3, R-2, S-6

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 59 Question Type : MCQ

Match the plant products with their sources and the plant parts from which they are obtained.

Product	Source	Plant part
P. Annatto	1. <i>Acacia catechu</i>	i. Seed
Q. Cutch	2. <i>Rubia tinctorum</i>	ii. Leaf
R. Henna	3. <i>Bixa orellana</i>	iii. Root
S. Alizarin	4. <i>Lawsonia inermis</i>	iv. Stem

- (A) P-3-ii, Q-4-i, R-2-iii, S-1-iv  
(C) P-2-ii, Q-1-iii, R-4-iv, S-3-i

- (B) P-3-i, Q-1-iv, R-4-ii, S-2-iii  
(D) P-4-ii, Q-3-iv, R-1-iii, S-2-i

Options :

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

Question Number : 60 Question Type : MCQ

Match the floral structures with the families and representative plant species.

Floral structure	Family	Plant
P. Gynostegium	1. Orchidaceae	i. <i>Ocimum sanctum</i>
Q. Gynostemium	2. Lamiaceae	ii. <i>Cleome gynandra</i>
R. Gynobasic style	3. Capparidaceae	iii. <i>Calotropis procera</i>
S. Gynophore	4. Asclepiadaceae	iv. <i>Vanilla planifolia</i>

(A) P-2-i, Q-3-iii, R-4-ii, S-1-iv

(B) P-3-ii, Q-4-I, R-2-iii, S-1-iv

(C) P-4-iii, Q-1-iv, R-2-i, S-3-ii

(D) P-4-ii, Q-2-iii, R-1-iv, S-3-i

Options :

1. ✗ A

2. ✗ B

3. ✓ C

4. ✗ D

Question Number : 61 Question Type : MCQ

Identify the INCORRECT statements with respect to plastid transformation.

P. Antibiotic used for selection of trasplastomic plant is spectinomycin

Q. Chances of gene escape from transplastomic plants are high

R. Microprojectile bombardment is the method of DNA delivery

S. Levels of transgene expression are low

(A) P, R

(B) P, Q

(C) Q, S

(D) R, S

Options :

1. ✗ A

2. ✗ B

3. ✓ C

4. ✗ D

Question Number : 62 Question Type : MCQ

Which of the following statements are TRUE with regard to the similarities between Crassulacean Acid Metabolism (CAM) and C<sub>4</sub> cycle?

P. Stomata open during night and remain closed during the day

Q. PEPcase is the carboxylating enzyme to form C<sub>4</sub> acid

R. C<sub>4</sub> acid is decarboxylated to provide CO<sub>2</sub> for C<sub>3</sub> cycle

S. Kranz anatomy is predominant in both CAM and C<sub>4</sub> plants

(A) P, S

(B) Q, R

(C) P, Q

(D) R, S

Options :

1. ✗ A

2. ✓ B

3. ✗ C

4. ✗ D



Question Number : 63 Question Type : MCQ

With respect to germination of seeds, the **CORRECT** sequence of events is

- P. Seed imbibes water
- Q. Mobilization of starch reserve to embryo
- R. Diffusion of gibberellin from embryo to aleurone layer
- S. Synthesis of  $\alpha$ -amylase in the aleurone layer

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

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 64 Question Type : MCQ

Identify the **CORRECT** statements with regard to the function of plant hormones

- P. ABA is synthesized from chorismate and promotes viviparous germination
- Q. Auxin induces acidification of cell wall followed by turgour-induced cell expansion
- R. Gibberellin-reponsive genes become activated by the repression of DELLA protein
- S. Cytokinin regulates the  $G_2$  to M transition in the cell cycle

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

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 65 Question Type : MCQ

Statements given below are either **TRUE** (T) or **FALSE** (F). Find the correct combination.

- P. Somatic embryo is unipolar in nature
- Q. Heterokaryon can be selected using a fluorescence-activated cell sorter (FACS)
- R. The term somaclonal variation is coined by Larkin and Scowcroft
- S. Differentiation of shoot buds during *in vitro* culture is known as somatic embryogenesis

- (A) P-T, Q-F, R-T, S-F  
(B) P-F, Q-T, R-F, S-T  
(C) P-T, Q-F, R-F, S-T  
(D) P-F, Q-T, R-T, S-F

Options :

1. ✗ A
2. ✗ B
3. ✗ C
4. ✓ D

Question Number : 66 Question Type : MCQ

Lophotrichous bacteria have

- (A) one flagellum
- (B) a cluster of flagella at one or both ends
- (C) flagella that are spread evenly over the whole surface
- (D) a single flagellum at each pole

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 67 Question Type : MCQ

In aerobic respiration, the final electron acceptor is

- (A) hydrogen
- (B) nitrogen
- (C) sulfur
- (D) oxygen

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 68 Question Type : MCQ

A process in which fatty acids are shortened by two carbons at a time resulting in release of acetyl-CoA is known as

- (A) photophosphorylation
- (B) carboxylation
- (C)  $\beta$ -oxidation
- (D) oxidative phosphorylation

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 69 Question Type : MCQ

Limulus Amoebocyte Lysate (LAL) assay is used to identify the presence of

- (A) endotoxin
- (B) exotoxin
- (C) anthrax toxin
- (D) tetanus toxin

Options :

- ✓ A
- ✗ B
- ✗ C
- ✗ D

Question Number : 70 Question Type : MCQ

Match scientists in Group I with terms related to their major scientific contributions in Group II

**Group I**

- (P) Sanger
- (Q) Watson and Crick
- (R) Waksman
- (S) Bordet

**Group II**

- (i) DNA double helix structure
- (ii) DNA sequencing
- (iii) Complement
- (iv) Streptomycin
- (v) Immune tolerance

- (A) P-iii, Q-iv, R-ii, S-i
- (C) P-iv, Q-i, R-ii, S-v

- (B) P-ii, Q-iii, R-iv, S-v
- (D) P-ii, Q-i, R-iv, S-iii

Options :

- ✗ A
- ✗ B
- ✗ C
- ✓ D

Question Number : 71 Question Type : MCQ

Base-pair substitutions caused by the chemical mutagen ethyl methane sulfonate are a result of

- (A) hydroxylation
- (B) alkylation
- (C) deamination
- (D) intercalation

Options :

- ✗ A
- ✓ B
- ✗ C
- ✗ D

Question Number : 72 Question Type : MCQ

The classical way of representing taxonomic hierarchy of living organisms in **ASCENDING ORDER** is

- (A) genus, species, class, order, family
- (B) species, genus, order, family, class
- (C) species, genus, family, order, class
- (D) genus, species, order, class, family

Options :

- ✗ A
- ✗ B
- ✓ C
- ✗ D

Question Number : 73 Question Type : MCQ

Of the following, the most effective method to kill bacterial endospores is

- (A) moist heat sterilization (B) UV irradiation  
(C) filtration (D) pasteurization

Options :

1. ✓ A  
2. ✗ B  
3. ✗ C  
4. ✗ D

Question Number : 74 Question Type : MCQ

The class of enzymes, which catalyze addition of groups to double bonds and non-hydrolytic removal of chemical groups, is

- (A) oxidoreductase (B) transferase (C) hydrolase (D) lyase

Options :

1. ✗ A  
2. ✗ B  
3. ✗ C  
4. ✓ D

Question Number : 75 Question Type : MCQ

Anammox organisms carry out

- (A) anaerobic reduction of  $\text{NO}_3^-$  (B) anaerobic oxidation of  $\text{NH}_4^+$   
(C) aerobic oxidation of  $\text{NH}_4^+$  (D) aerobic oxidation of  $\text{NO}_2^-$

Options :

1. ✗ A  
2. ✓ B  
3. ✗ C  
4. ✗ D

Question Number : 76 Question Type : MCQ

Which combination of the following statements about specialized transduction is **TRUE**?

- (P) Specialized transducing phages can transport only certain genes between bacteria  
(Q) Specialized transducing phages can transport any gene between bacteria  
(R) Phage P22 is a specialized transducing phage  
(S) Phage lambda ( $\lambda$ ) is a specialized transducing phage

- (A) P and S only (B) Q and R only  
(C) P and R only (D) Q and S only

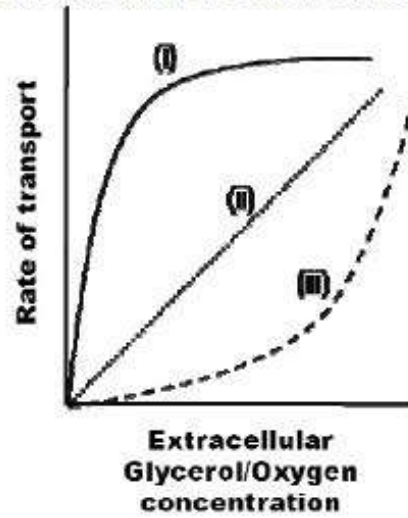
Options :

1. ✓ A

2. ✘ B
3. ✘ C
4. ✘ D

Question Number : 77 Question Type : MCQ

Which combination of profiles in the following figure accurately represents the transport rate of glycerol and oxygen into *E. coli* cells as a function of their extracellular concentration?



- |                                    |                                  |
|------------------------------------|----------------------------------|
| (A) glycerol-(ii) and oxygen-(iii) | (B) glycerol-(ii) and oxygen-(i) |
| (C) glycerol-(iii) and oxygen-(i)  | (D) glycerol-(i) and oxygen-(ii) |

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 78 Question Type : MCQ

Which one of the following about the standard free energy change ( $\Delta G^{\circ}$ ) and the equilibrium constant ( $K_{eq}$ ) of an exergonic reaction, at pH 7.0, is TRUE?

- (A)  $\Delta G^{\circ}$  is positive and  $K_{eq}$  is less than one
- (B)  $\Delta G^{\circ}$  is negative and  $K_{eq}$  is less than one
- (C)  $\Delta G^{\circ}$  is negative and  $K_{eq}$  is greater than one
- (D)  $\Delta G^{\circ}$  is positive and  $K_{eq}$  is greater than one

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 79 Question Type : PCV

An oil immersion objective of a light microscope has a numerical aperture of 1.25. Using the Abbé equation, the maximum theoretical resolving power (in nm) of the microscope with this objective and blue light (wavelength = 450 nm) is \_\_\_\_\_

Eq t gev' Cpuy gt :

180

Question Number : 80 Question Type : PCV

The working volume (in liter) of a chemostat with  $0.1 \text{ h}^{-1}$  dilution rate and  $100 \text{ ml/h}$  feed flow rate is \_\_\_\_\_

Eq t gev' Cpuy gt :

1

Question Number : 81 Question Type : PCV

If the decimal reduction time for spores of a certain bacterium at  $121^\circ\text{C}$  is 12 seconds, the time required (in minutes) to reduce  $10^{10}$  spores to one spore by heating at  $121^\circ\text{C}$  is \_\_\_\_\_

Eq t gev' Cpuy gt :

2

Question Number : 82 Question Type : PCV

The doubling time (in minutes) of a bacterium with a specific growth rate of  $2.3 \text{ h}^{-1}$  in  $500 \text{ ml}$  of growth medium is \_\_\_\_\_

Eq t gev' Cpuy gt :

17.9 to 18.3

Question Number : 83 Question Type : PCV

A bacterial culture is grown using  $2.0 \text{ mg/ml}$  fructose as the sole source of carbon and energy. The bacterial biomass concentrations immediately after inoculation and at the end of the growth phase are  $0.1 \text{ mg/ml}$  and  $0.9 \text{ mg/ml}$ , respectively. Assuming complete utilization of the substrate, the bacterial growth yield ( $Y$ ) on fructose is \_\_\_\_\_

Eq t gev' Cpuy gt :

0.4

Question Number : 84 Question Type : PCV

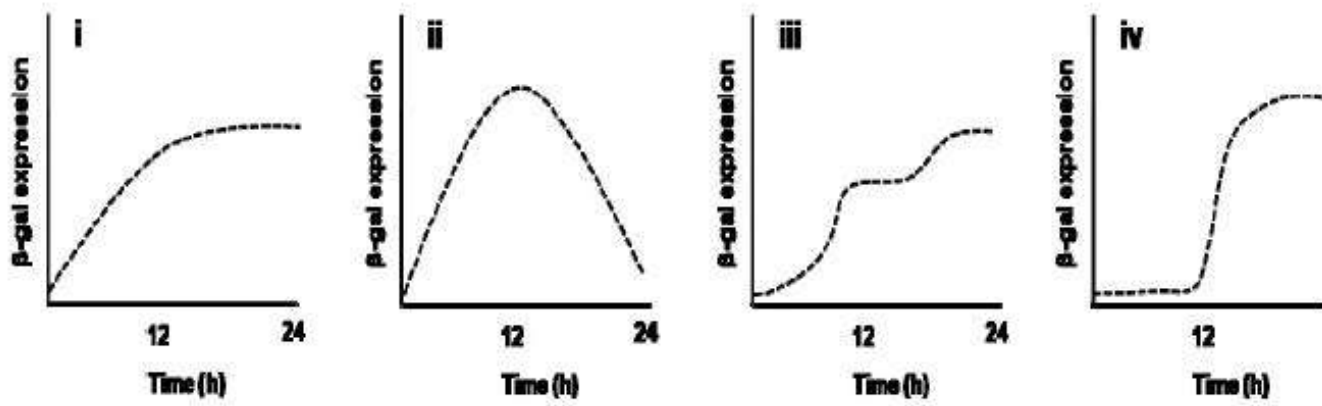
The volume (in ml) of a 1.0 mg/ml stock solution of ampicillin to be added to 0.1 liter of growth medium for achieving a final ampicillin concentration of 50  $\mu\text{g/ml}$  is \_\_\_\_\_

Eq t gev Cpuy gt :

5

Question Number : 85 Question Type : MCQ

An *E. coli* strain is grown initially on glucose as the sole carbon source. Upon complete consumption of glucose following 12 h of growth, lactose is added as the sole carbon source and the strain is further grown for 12 h. Assuming that the *E. coli* strain has a functional wild type *lac* operon, which one of the following profiles is the most ACCURATE representation of  $\beta$ -galactosidase ( $\beta$ -gal) expression (in arbitrary units)?



- (A) i (B) iii (C) ii (D) iv

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Zoology

Number of Questions:

20

Section Marks:

30.0

Question Number : 86 Question Type : MCQ

The term "paedomorphosis" refers to

- (A) Accelerated reproductive development as compared to somatic development
- (B) A transient stage in the developmental event
- (C) Two independent structures resembling each other, yet performing different functions
- (D) A form of mimicry

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 87 Question Type : MCQ

Which one of the following statements is TRUE when determining the age of a fossil using carbon dating?

- (A) Carbon dating is based on carbon-13 to carbon-12 ratio in fossils
- (B) Carbon dating is useful for determining the age of only fossils older than 100,000 years
- (C) Older the fossil, lesser the carbon-14 to carbon-12 ratio
- (D) Older the fossil, lesser the carbon-12 to carbon-14 ratio

Options :

1. ✗ A
2. ✗ B
3. ✓ C
4. ✗ D

Question Number : 88 Question Type : MCQ

Constitutive enzymes are

- (A) Induced by effector molecules
- (B) Repressed by repressors
- (C) Encoded by sequences that occur as part of an operon
- (D) Always produced in the cell

Options :

1. ✗ A
2. ✗ B
3. ✗ C
4. ✓ D

Question Number : 89 Question Type : MCQ

Which one of the following is a function of intermediate filaments?

- (A) Chromosome movement during the cell division
- (B) Cytoplasmic streaming
- (C) Formation of tight junctions
- (D) Anchorage of the nucleus

Options :

1. ✗ A
2. ✗ B
3. ✗ C
4. ✓ D

Question Number : 90 Question Type : MCQ



Which one of the following statements is FALSE with respect to phospholipids?

- (A) Phospholipids have amphipathic character
- (B) Phospholipids form the lipid bilayer of the cell membrane
- (C) Phospholipids form micelles in living systems
- (D) Some phospholipid molecules may contain a double bond in hydrophobic tails

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 91 Question Type : MCQ

Which one of the following organs is INCORRECTLY paired with its function?

- (A) Intestinal villi – absorption
- (B) Epiglottis – closure of larynx
- (C) Gall bladder – carbohydrate digestion
- (D) Parietal cells – hydrochloric acid

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 92 Question Type : MCQ

Where do B lymphocytes acquire immune competence?

- (A) Thymus
- (B) Bone Marrow
- (C) Lymph nodes
- (D) Spleen

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 93 Question Type : MCQ

Which one of the following life cycle stages of *Plasmodium falciparum* is infectious?

- (A) Sporozoite
- (B) Cryptozoite
- (C) Merozoite
- (D) Trophozoite

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 94 Question Type : MCQ

What is the role of the notochord during organogenesis in a vertebrate embryo?

- (A) Signaling the development of placenta
- (B) Induction of neural plate formation
- (C) Stimulation of the umbilical chord formation
- (D) Suppression of the development of extra-embryonic membranes

Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

Question Number : 95 Question Type : MCQ

The behavior of young ducks following their mother is known as

- (A) Imprinting
- (B) Innate behavior
- (C) Habituation
- (D) Mimicry

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 96 Question Type : MCQ

Match the species names with class names

- |                                   |                     |
|-----------------------------------|---------------------|
| P. <i>Calotes versicolor</i>      | i. Insecta          |
| Q. <i>Periplaneta americana</i>   | ii. Reptilia        |
| R. <i>Glyphidrilus birmanicus</i> | iii. Actinopterygii |
| S. <i>Clarias batracus</i>        | iv. Clitellata      |

- (A) P-ii; Q-i, R-iv; S-iii
- (B) P-i; Q-ii; R-iii; S-iv
- (C) P-ii; Q-i; R-iii; S-iv
- (D) P-iii; Q-i; R-ii; S-iv

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 97 Question Type : MCQ

A population of spotted deer found in a national forest is in Hardy-Weinberg equilibrium. For a particular genetic locus in this deer species, only two alleles  $A$  and  $a$  are possible. If the frequency of the  $A$  allele in this population is 0.6, and the frequency of the  $a$  allele is 0.4, what will be the frequency of the genotype  $Aa$ ?

- (A) 0.24
- (B) 0.48
- (C) 0.96
- (D) 1.6

Options :

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

Question Number : 98 Question Type : MCQ

In *Drosophila*, the gene for eye colour is present on the X chromosome. When a red-eyed female was mated with a white-eyed male, a total of 100 progeny were obtained – 50 females and 50 males. Of the 50 females, 25 were red-eyed, and 25 were white-eyed. How many of the male progeny were red-eyed?

- (A) 0                      (B) 10                      (C) 20                      (D) 25

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 99 Question Type : MCQ

Defect in poly-A tail formation in eukaryotic mRNA leads to

- (A) Increased translation of the resulting mRNA  
(B) Decreased translation of the resulting mRNA  
(C) Premature transcription termination  
(D) Decreased mRNA stability

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 100 Question Type : MCQ

Assuming equal frequency for all 4 nucleotides (G, A, T, C), how many EcoRI recognition sites (GAATTC) are possible in a bacterial artificial chromosome of 100,000 base pairs?

- (A) 6                      (B) 12                      (C) 24                      (D) 48

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 101 Question Type : MCQ

Choose the correct option that shows pairing of the organelle to its function

- |                                 |                                 |
|---------------------------------|---------------------------------|
| P. Smooth endoplasmic reticulum | i. Internalization of receptors |
| Q. Peroxisome                   | ii. Protein secretion           |
| R. Golgi apparatus              | iii. Membrane biogenesis        |
| S. Endosome                     | iv. Breakdown of fatty acids    |

- (A) P-i, Q-ii, R-iii, S-iv  
(B) P-i, Q-iii, R-ii, S-iv  
(C) P-iii, Q-iv, R-ii, S-i  
(D) P-ii, Q-iii, R-iv, S-i

Options :

- ✘ A
- ✘ B
- ✔ C
- ✘ D

Question Number : 102 Question Type : MCQ

Choose the correct option based on your understanding of the circulatory system

- |                              |                 |
|------------------------------|-----------------|
| P. Open circulatory system   | i. Fish         |
| Q. Closed circulatory system | ii. Frog        |
| R. Three chambered heart     | iii. Earthworm  |
| S. Two chambered heart       | iv. Grasshopper |

- (A) P-iv, Q-iii, R-ii, S-i  
(B) P-iv, Q-i, R-ii, S-iii  
(C) P-i, Q-iv, R-ii, S-iii  
(D) P-i, Q-iii, R-iv, S-ii

Options :

- ✔ A
- ✘ B
- ✘ C
- ✘ D

Question Number : 103 Question Type : MCQ

The popular birth control pills for women have a combination of synthetic forms of estradiol and progesterone. Which one of the following statements is INCORRECT with regard to their function as contraceptive?

- (A) The pills inhibit the release of GnRH leading to inhibition of gonadotropin-stimulated ovarian function  
(B) They act directly on the pituitary gland to inhibit gonadotropin surges  
(C) The low dose of estradiol in the pill inhibits the release of FSH, and thus blocks ovulation  
(D) The synthetic forms of estradiol and progesterone bring about their effects by binding to their respective intracellular receptors

Options :

- ✘ A
- ✘ B
- ✔ C
- ✘ D

Question Number : 104 Question Type : MCQ

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Which one of the following is consistent with the germplasm theory of August Weismann?

- (A) Regulative development observed in frog embryos
- (B) Mosaic development observed in tunicates
- (C) Normal embryonic development of embryos formed by somatic nuclear transfer
- (D) Ability of differentiated cells to form pluripotent stem cells under certain conditions

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 105 Question Type : MCQ

Which one of the following statements DOES NOT explain altruism?

- (A) Altruism reduces the fitness of the individual that displays this behavior
- (B) Altruism increases the fitness of other individuals in the population
- (C) Altruism reduces the fitness of the individual that displays this behavior and at the same time increases the fitness of other individuals in the population
- (D) Altruistic behavior helps the individual escape from predators

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

#### Food Technology

Number of Questions:  
Section Marks:

20  
30.0

Question Number : 106 Question Type : MCQ

Standard pasteurization protocol for milk is adequate for destroying

- (A) *Clostridium sporogenes*
- (B) *Bacillus cereus*
- (C) *Clostridium botulinum*
- (D) *Listeria monocytogenes*

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 107 Question Type : MCQ

Which one of the following is NOT a component of an evaporator?

- (A) Heat exchanger (B) Vacuum separator  
(C) Condenser (D) Cyclone separator

Options :

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Question Number : 108 Question Type : MCQ

Among the following animal foods, the fat content is least in

- (A) Beef (B) Chicken meat (C) Pork (D) Lamb flesh

Options :

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

Question Number : 109 Question Type : MCQ

The enzyme that hydrolyzes starch to maltose is

- (A)  $\alpha$ -amylase (B)  $\beta$ -amylase  
(C) glucoamylase (D) cyclodextrin glucanotransferase

Options :

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

Question Number : 110 Question Type : MCQ

Which one of the following is NOT enriched in endosperm during parboiling of paddy?

- (A) Thiamine (B) Niacin (C) Iron (D) Fat

Options :

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Question Number : 111 Question Type : MCQ

Heat-treated legume seed proteins are more digestible than those of untreated legume seed proteins due to

- (A) reaction of reducing sugars with  $\epsilon$ -amino group of lysine
- (B) increased binding of lectins to intestinal mucosal cells
- (C) thermolabile nature of lectins and Kunitz-type protease inhibitors
- (D) thermolabile nature of Bowman-Birk type of inhibitor

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 112 Question Type : MCQ

What is the percent relative humidity at which both the dry bulb and wet bulb thermometers would record equal temperatures?

- (A) 0
- (B) 10
- (C) 50
- (D) 100

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✗ C
- 4. ✓ D

Question Number : 113 Question Type : MCQ

How many fold would the  $g$ -number of a centrifuge increase by doubling both the spinning speed and bowl diameter?

- (A) 2
- (B) 4
- (C) 8
- (D) 16

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 114 Question Type : MCQ

Prolonged fermentation of cocoa seeds lead to "off-taste" due to the release of

- (A) glucose
- (B) short chain fatty acids
- (C) carbon dioxide
- (D) phospholipids

Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D



Question Number : 115 Question Type : MCQ

The gradual decrease in viscosity of tomato paste during storage can be prevented by quickly heating it to 82 °C, because

- (A) water soluble pectin interacts with calcium
- (B) hemicellulose prevents decrease in viscosity
- (C) lignin prevents decrease in viscosity
- (D) pectin methyl esterase is inactivated

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 116 Question Type : MCQ

Match the enzyme in Group I with its corresponding application in Group II

Group I

- (P) Chymosin
- (Q) Sulphydryl oxidase
- (R)  $\beta$ -Galactosidase
- (S) Microbial proteases

Group II

- (1) Removal of cooked flavor from milk
- (2) Soybean milk coagulation
- (3) For rennet puddings
- (4) Lactose removal

- (A) P-3, Q-2, R-1, S-4
- (C) P-1, Q-3, R-4, S-2

- (B) P-3, Q-1, R-4, S-2
- (D) P-4, Q-3, R-2, S-1

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 117 Question Type : PCV

Milk is flowing at 0.12 m<sup>3</sup>/min in a 2.5 cm diameter pipe. The temperature of the milk is 21 °C and the corresponding viscosity and density are 2.1 x 10<sup>-3</sup> Pas and 1029 kg/m<sup>3</sup>, respectively. If the flow is found to be turbulent under the given conditions, the Reynolds number is \_\_\_\_\_

Eqtt gevCpuy gt:

49000 to 50225

Question Number : 118 Question Type : PCV

Whole milk (34,950 kg) containing 4% fat is to be separated in 6 h period into skim milk with 0.45% fat and cream with 45% fat. The flow rate of cream stream (kg/h) from the separator is \_\_\_\_\_

Equitgev/Cpuy gt :

455 to 475

Question Number : 119 Question Type : MCQ

Match the edible plant tissue in Group I with the type of carotenoid given in Group II

Group I

- (P) Corn
- (Q) Red pepper
- (R) Pumpkin
- (S) Tomato

Group II

- (1) Lycopene
- (2)  $\beta$ -Carotene
- (3) Capsanthin
- (4) Lutein

(A) P-3, Q-4, R-2, S-1

(C) P-4, Q-3, R-2, S-1

(B) P-2, Q-1, R-3, S-4

(D) P-1, Q-2, R-4, S-3

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 120 Question Type : MCQ

Green tea is considered to be a more healthy option than black tea because it

(A) has high content of polyphenols

(B) is richer in thearubigin

(C) does not require any sweetener during tea preparation

(D) has no microbial load

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 121 Question Type : PCV

A dilute pineapple juice is heated in a double pipe heat exchanger from 28 °C to 75 °C by heat exchanging with hot water flowing in shell in counter current direction. Hot water is entering the shell at 95 °C and leaving at 85 °C. The log mean temperature difference (°C) is \_\_\_\_\_

Equitgev/Cpuy gt :

35.0 to 36.0

Question Number : 122 Question Type : PCV

Granulated sugar, having an average particle size of 500  $\mu\text{m}$ , is milled to produce icing sugar having an average particle size of 25  $\mu\text{m}$ . The power requirement was 10 kW as obtained by Rittinger's law. If the same mill were to be used to produce fondant sugar having an average particle size of 20  $\mu\text{m}$  at the same capacity, the power requirement (kW) would be \_\_\_\_\_

Eq t gev Cpuy gt :

12.4 to 12.8

Question Number : 123 Question Type : PCV

One ton of soybean containing 18% oil, 35% protein, 27.1% carbohydrates, 9.4% of fibre and ash, and 10.5% moisture is crushed and pressed. The residual oil content in the pressed cake is 6%. Assuming that there is no loss of protein and water with oil, the amount of oil (kg) obtained from the crusher is \_\_\_\_\_

Eq t gev Cpuy gt :

127 to 128

Question Number : 124 Question Type : MCQ

Match the processing method in Group I with the operation carried out in Group II

Group I	Group II
(P) Degumming	(1) Crystallization of triacylglycerol by cooling to remove fat crystals
(Q) Deacidifying	(2) Passing heated oil over charcoal
(R) Bleaching	(3) Using alkaline solution to remove fatty acids
(S) Winterizing	(4) Wetting with water to remove lecithin
(A) P-3, Q-1, R-4, S-2	(B) P-4, Q-3, R-1, S-2
(C) P-4, Q-3, R-2, S-1	(D) P-3, Q-1, R-2, S-4

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 125 Question Type : MCQ

The order of succession of microbes in the spoilage of milk, involving (P) *Lactobacillus*, (Q) protein digesting bacteria, (R) *Lactococcus lactis*, (S) yeasts and molds, is

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

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

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