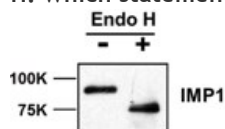


Topic:- GENETICS PHD S2

1) A cell lysate was solubilized in presence of non-ionic detergent and treated with Endo H which cleaves N-linked glycosyl moieties. Shown below are western blots with antibodies to integral membrane protein IMP1 in absence or presence of Endo H. Which statement below best describes the cellular localization of IMP1?



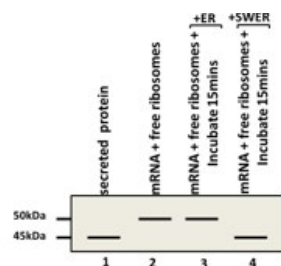
[Question ID = 9414]

1. IMP1 is an ER resident protein [Option ID = 37650]
2. IMP1 is a Golgi resident protein [Option ID = 37651]
3. IMP1 traffics from ER to Golgi and back [Option ID = 37652]
4. IMP1 is plasma membrane protein [Option ID = 37653]

Correct Answer :-

- IMP1 is an ER resident protein [Option ID = 37650]

2) Shown are results of an in vitro translation experiments using mRNA of a protein with free ribosomes (lane 2), mRNA+ free ribosomes followed by addition of ER or salt washed (SW) ER membranes 15 minutes after translation initiation (lane 3,4). As control secreted protein from this specific mRNA is loaded in lane 1. Answer the following question based on this data



What effect does the salt washing have on the ER?

[Question ID = 9415]

1. It strips a peripheral membrane protein required for transport of newly synthesized protein product into the ER [Option ID = 37654]
2. It strips a transmembrane channel protein required for transport of newly synthesized protein product into the ER [Option ID = 37655]
3. It strips a ER lumen protease required for cleavage of the precursor protein [Option ID = 37656]
4. It induces a steric hindrance at the ER protein insertion channel [Option ID = 37657]

Correct Answer :-

- It strips a peripheral membrane protein required for transport of newly synthesized protein product into the ER [Option ID = 37654]

3) The translation of an mRNA encoding a secretory protein using a cell free translation system containing microsomes (ER) lacking signal recognition particles (SRP) is initiated. Shortly afterwards SRP molecules are added followed by further incubation. Which of the following outcome is the most likely?

[Question ID = 9416]

1. Protein synthesis will begin but will be terminated prematurely leading to shorter products [Option ID = 37658]
2. The protein will be fully synthesized and incorporated into microsomes [Option ID = 37659]
3. The protein will be fully synthesized and its signal sequence will be removed without being incorporated into microsomes [Option ID = 37660]
4. The protein will be fully synthesized but not incorporated into microsomes [Option ID = 37661]

Correct Answer :-

- The protein will be fully synthesized and incorporated into microsomes [Option ID = 37659]

4) In a study of Lysine biosynthesis in yeast, six mutant haploids requiring supplemented Lysine (Lys1-6) in the culture medium for viability were isolated. The mutant haploids were fused in pairwise combinations to form diploids, whose requirement for Lysine was tested. The results of the tests are shown below where (+) indicates diploid combination yielding Lysine prototrophs. How many different Lys genes are represented among the six mutants?

	Lys1	Lys2	Lys3	Lys4	Lys5	Lys6
Lys1	-	-	+	+	+	+
Lys2	-	-	+	+	+	+
Lys3	+	+	-	+	+	+
Lys4	+	+	+	-	+	+
Lys5	+	+	+	+	-	-
Lys6	+	+	+	+	-	-

1. One [Option ID = 9417]
2. Two [Option ID = 37662]
3. Three [Option ID = 37664]
4. Four [Option ID = 37665]

Correct Answer :-

- Four [Option ID = 37665]

5) You have five yeast strains each having distinct temperature sensitive allele of YFG1 named ts1-ts5 for impaired growth at 42°C. In the laboratory you identify a suppressor to ts2 named sup2 which restores growth at 42°C. Using pairwise crossing you combine ts1-ts5 with sup2. It turns out that sup2 when combined with ts1-ts5 suppresses impaired growth at 42°C. Which statement below best describes sup2 function with respect to YFG1?

[Question ID = 9418]

- SUP2 is a dosage suppressor of YFG1 [Option ID = 37666]
- SUP2 is an interaction suppressor of YFG1 [Option ID = 37667]
- SUP2 is a bypass suppressor of YFG1 [Option ID = 37668]
- SUP2 is neither a dosage nor a bypass suppressor of YFG1 [Option ID = 37669]

Correct Answer :-

- SUP2 is a bypass suppressor of YFG1 [Option ID = 37668]

6) Shown below are results of protease digestion reaction of sealed membrane vesicles derived from cells expressing membrane bound protein Mtg2p tagged with HA at the N-terminus and with Myc at the C-terminus. Which statement best describes the localization of Mtg2p?



[Question ID = 9419]

- N-terminus faces the cytosol and C-terminus faces the lumen of the membrane vesicle [Option ID = 37670]
- C-terminus faces the cytosol and N-terminus faces the lumen of the membrane vesicle [Option ID = 37671]
- N-terminus and C-terminus both face the lumen of the membrane vesicle [Option ID = 37672]
- N-terminus and C-terminus both face the cytosol [Option ID = 37673]

Correct Answer :-

- N-terminus faces the cytosol and C-terminus faces the lumen of the membrane vesicle [Option ID = 37670]

7) An alpha-helical conformation of a globular protein in solution is best determined by which of the following?

[Question ID = 9420]

- Fluorescence spectroscopy [Option ID = 37674]
- Circular Dichroism [Option ID = 37675]
- Analytical centrifugation [Option ID = 37676]
- NMR spectroscopy [Option ID = 37677]

Correct Answer :-

- Circular Dichroism [Option ID = 37675]

8) You have a mixture of four proteins (P1-P4) in a Tris-Cl, pH7.5 solution. The isoelectric point (pI) of each protein is P1:4.5, P2: 9.6, P3:10.7 and P4:5.6. You separate them on a cation exchange column. Which best represents the protein(s) distribution in the flow through and eluate fractions?

[Question ID = 9421]

- Flow through: P1,P2,P3 and eluate: P4 [Option ID = 37678]
- Flow through: P1,P2, and eluate: P3,P4 [Option ID = 37679]
- Flow through: P1,P2,P3,P4 and eluate: None [Option ID = 37680]
- Flow through: P2,P3 and eluate: P1,P4 [Option ID = 37681]

Correct Answer :-

- Flow through: P2,P3 and eluate: P1,P4 [Option ID = 37681]

9) Which of the following techniques can be utilized to demonstrate Protein:RNA interaction?

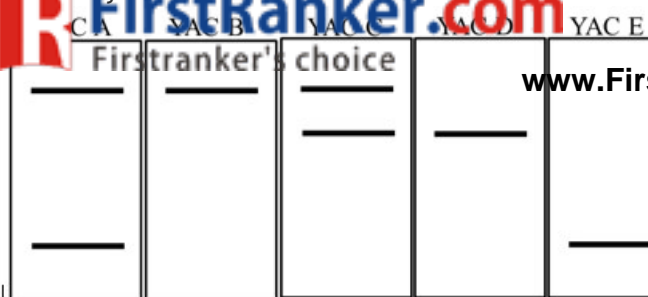
[Question ID = 9422]

- Fluorescence resonance energy transfer (FRET) [Option ID = 37682]
- Co-immunoprecipitation [Option ID = 37683]
- Yeast three hybrid assay [Option ID = 37684]
- Yeast two hybrid assay [Option ID = 37685]

Correct Answer :-

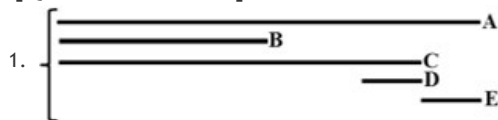
- Yeast three hybrid assay [Option ID = 37684]

10) Five different Yeast Artificial Chromosomes, YACs (A to E) containing genomic fragments were found to hybridize to one specific chromosome band in humans. The human genomic DNA was digested with a rare-cutting restriction enzyme.

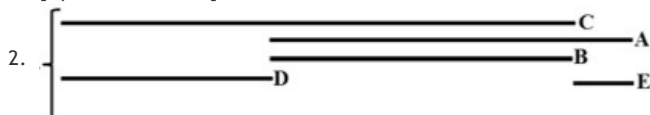


On the basis of the autoradiogram the location of the YACs in relation to the three genomic restriction fragments was identified. Which of the following is a correct representation?

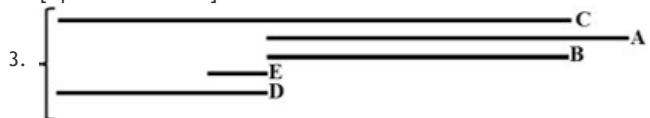
[Question ID = 9423]



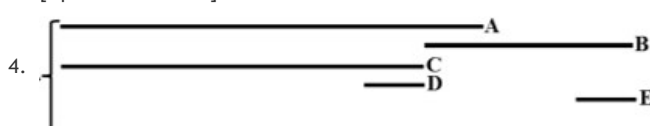
[Option ID = 37686]



[Option ID = 37687]

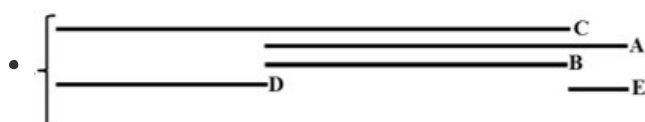


[Option ID = 37688]



[Option ID = 37689]

Correct Answer :-



[Option ID = 37687]

11) Deletion analysis of a tapetum specific plant promoter is carried out. Promoter::reporter constructs were developed with different deletions of the 1 Kb promoter as given in the table below. 20 independent transgenic lines were developed with each of these constructs and the expression of the reporter gene was recorded in tapetum and other tissues of the plants. The data is summarized in the table below:

S. No.	Region of the 1 Kb promoter that was deleted	No of plants in which expression was observed in	
		Tapetum	Other tissues
1.	No deletion	20	1
2.	-750 to -1000 bp	20	0
3.	-500 to -1000 bp	20	15
4.	-250 to -1000 bp	1	18

The following interpretations were made to explain the above observations:

- The promoter has binding sites for positive regulators in the -500 to -750 bp region for its activity in tissues other than tapetum
- The promoter has binding sites for positive regulators in the -250 to -500 bp region for its activity in tapetum tissue
- The promoter utilizes both positive and negative regulators

Which of the above statements are correct?

[Question ID = 9424]

1. (i) only

3. (ii) and (iii) only

[Option ID = 37692]

4. (i), (ii) and (iii)

[Option ID = 37693]

Correct Answer :-

- (ii) and (iii) only

[Option ID = 37692]

12) A cDNA was cloned under a promoter present in the vector pPKB1. The cDNA was cloned at the *Bam*HI site downstream to the promoter present in the vector. In order to identify a proper clone which will express the cloned cDNA fragment digestions with restriction enzymes were carried out. Which one of the following digestions would be least ideal to identify the correct clone

[Question ID = 9425]

1. Digestion with *Bam*HI alone

[Option ID = 37694]

2. Digestion with *Bam*HI and another enzyme whose site is present once in the cDNA fragment

[Option ID = 37695]

3. Digestion with an enzyme which has two sites, one present in the cDNA one in the vector pPKB1

[Option ID = 37696]

4. Digestion with *Bam*HI and another enzyme which has two sites, one present in the cDNA and one in the vector pPKB1

[Option ID = 37697]

Correct Answer :-

- Digestion with *Bam*HI alone

[Option ID = 37694]

13) Which one of the following mechanisms of gene regulation found in prokaryotes cannot have parallels in eukaryotic system?

[Question ID = 9426]

1. Negative regulation like lac-repressor-operator found in prokaryotes [Option ID = 37698]

2. Regulating transcription elongation using signals for attenuation as found in Trp operon [Option ID = 37699]

3. Regulation of transcription by DNA looping as observed in the Ara operon. [Option ID = 37700]

4. Regulating translation initiation by the presence and absence of stem loop structures in the 5' end of the RNA as observed in case of N protein of lambda phage [Option ID = 37701]

Correct Answer :-

- Regulating transcription elongation using signals for attenuation as found in Trp operon [Option ID = 37699]

14) Human carcinoma cell line, HELA clones expressing *XBP1* (which encodes an RNase) needs to be created. To develop such lines where the gene is expressed under a mammalian specific promoter, cloning needs to be done in *E. coli*. It is however difficult to make these constructs in *E. coli* as any leaky expression of the gene kills the cell. Which one of the following approaches is the best choice to ensure that such constructs are easily developed in *E. coli*?

[Question ID = 9427]

1. Clone the gene under engineered mammalian specific promoters which have operator sequences to block expression in *E. coli*

[Option ID = 37702]

2. Clone a *XCP1* gene (which encodes the inhibitor for Xbp1 protein) along with the *XBP1* gene

[Option ID = 37703]

3. Fuse a DNA fragment to the *XBP1* gene. The DNA fragment encodes for a peptide which helps in secretion of the protein out of the cell

[Option ID = 37704]

4. Clone an intron in the *XBP1* gene

[Option ID = 37705]

Correct Answer :-

- Fuse a DNA fragment to the *XBP1* gene. The DNA fragment encodes for a peptide which helps in secretion of the protein out of the cell

[Option ID = 37704]

15) In order to study the affinity of a protein to four different sequences of oligonucleotides (i to iv), a gel retardation assay was carried out. In this assay the protein was incubated with a radiolabelled oligonucleotide either in the presence or absence of unlabelled sheared salmon sperm DNA. Following gel electrophoresis the intensity of the retarded oligonucleotide band was recorded. The results obtained are tabulated below:

	Intensity of the retarded
--	---------------------------

	in absence of salmon sperm DNA	in presence of salmon sperm DNA
Oligonucleotide i	100	60
Oligonucleotide ii	400	150
Oligonucleotide iii	150	100
Oligonucleotide iv	200	180

Which one of the above oligonucleotides has the highest affinity for the protein?

[Question ID = 9428]

1. Oligonucleotide i [Option ID = 37706]
2. Oligonucleotide ii [Option ID = 37707]
3. Oligonucleotide iii [Option ID = 37708]
4. Oligonucleotide iv [Option ID = 37709]

Correct Answer :-

- Oligonucleotide iv [Option ID = 37709]

16) Transgenic plants were developed with a gene resistant to the antibiotic kanamycin. Four independent T0 events were selfed and ~ 100 T1 seeds were germinated on kanamycin. The number of kanamycin sensitive (Kan^S) and kanamycin resistant (Kan^R) progeny obtained in each case is listed below :

Transgenic Line No.	Kan^R	Kan^S
One	95	7
Two	72	25
Three	51	47
Four	11	87

Identify the line where the transgene has integrated at a single locus

[Question ID = 9429]

1. Line One
[Option ID = 37710]
2. Line Two
[Option ID = 37711]
3. Line Three
[Option ID = 37712]
4. Line Four
[Option ID = 37713]

Correct Answer :-

- Line Two
[Option ID = 37711]

17) If you have weighed 20 mg of ampicillin and you want to make a 50 $\mu\text{g}/\mu\text{l}$ solution, what will be the final volume of the solution?

[Question ID = 9430]

1. 2.5 ml [Option ID = 37714]
2. 0.25 ml [Option ID = 37715]
3. 0.4 ml [Option ID = 37716]
4. 0.02 ml [Option ID = 37717]

Correct Answer :-

- 0.4 ml [Option ID = 37716]

BamHI digestion: 5.5 Kb and 4.0 Kb fragment

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SmaI digestion: 5.0 Kb and 4.5 Kb fragment

BamHI and SmaI double digestion : 3.0 Kb , 2.5 Kb and 2.0 Kb fragment

Based on the above the following set of conclusions were made:

- The 5.5 Kb BamHI fragment carries a SmaI site
- The 4.0 Kb BamHI fragment carries a SmaI site
- The 4.5 Kb SmaI fragment carries a BamHI site
- The 5.0 Kb SmaI fragment carries a BamHI site

Which of the above statements are correct?

[Question ID = 9431]

- Both (i) and (ii)

[Option ID = 37718]

- Both (iii) and (iv)

[Option ID = 37719]

- Both (i) and (iii)

[Option ID = 37720]

- Both (ii) and (iv)

[Option ID = 37721]

Correct Answer :-

- Both (i) and (ii)

[Option ID = 37718]

19) A plasmid is digested with ClaI (5'AT/CGAT 3') to linearize it at a cloning site and a DNA fragment is digested with PvuI (5' CGAT/CG 3') for cloning. Both the vector and the DNA fragment is treated with Klenow enzyme and four dNTP substrates to make them blunt ends following which they are ligated. Which one of the following represents the sequence of the junction fragment (at the point of ligation between blunt-ended EcoRI and KpnI)?

[Question ID = 9432]

- 5' ATCGCG 3' [Option ID = 37722]
- 5' TAGCTAGC 3' [Option ID = 37723]
- 5' ATCG 3' [Option ID = 37724]
- 5' CGATCGAT 3' [Option ID = 37725]

Correct Answer :-

- 5' ATCGCG 3' [Option ID = 37722]

20) PCR was carried out on genomic DNA to quantitate the copy number of a gene, 'A' in a tumour cell. A normal cell which has a single copy of the gene was used for comparison. Further in order to take care of differences, if any in the amount of template DNA taken for amplification in the two reactions, a gene known to have same copy number in normal and tumor cells was taken as an internal control. Four PCRs were thus set up. The cycle at which all the four reactions attained "X" amount of amplification product was recorded as below:

	Normal cells	Cancer cells
Gene 'A'	20	19
Internal control	21	22

The cycles were in the exponential phase of PCR.

Based on the above how many copies of Gene 'A' is present in the cancer cells?

[Question ID = 9433]

- 1

[Option ID = 37726]

- 2

[Option ID = 37727]

- 3

[Option ID = 37728]

- 4

[Option ID = 37729]

21) For expression of heterologous proteins in *E. coli* tRNA-supplemented strains have been developed. In these strains some tRNA gene are overexpressed. These strains are helpful to express genes from heterologous systems which have

[Question ID = 9434]

1. Codons that are rare in *E. coli*

[Option ID = 37730]

2. Stop codons which can be suppressed by the over expressed tRNA

[Option ID = 37731]

3. Codons very commonly used in *E. coli* and thus additional tRNA is needed to express the heterologous genes

[Option ID = 37732]

4. Could have signals for tRNA based attenuation

[Option ID = 37733]

Correct Answer :-

- Codons that are rare in *E. coli*

[Option ID = 37730]

22) Expression of gene 'X' was being analysed in liver and kidney of mouse. The gene is a single copy gene in the mouse genome. On carrying out Northern Blot hybridization it was observed that while in liver the transcript encoded by gene 'X' was of 2 Kb, in kidney its size was 1.5 Kb. The following reasons were proposed to explain the above observation:

- This is due to alternative splicing
- There are two different transcription start sites
- Two alternate promoters are used

Which of the above explanations could be correct?

[Question ID = 9435]

1. (i) only

[Option ID = 37734]

2. (i) and (ii) only

[Option ID = 37735]

3. (i) and (iii) only

[Option ID = 37736]

4. (i), (ii) and (iii)

[Option ID = 37737]

Correct Answer :-

- (i), (ii) and (iii)

[Option ID = 37737]

23) Lactose operon is an example of :

[Question ID = 9436]

- Inducible operon which uses both negative and positive regulators [Option ID = 37738]
- Repressible operon which uses both negative and positive regulators [Option ID = 37739]
- Inducible operon in presence of lactose and repressible in presence of glucose [Option ID = 37740]
- Inducible operon in presence of glucose and repressible in presence of lactose [Option ID = 37741]

Correct Answer :-

- Inducible operon which uses both negative and positive regulators [Option ID = 37738]

24) A DNA strand was being copied *in vitro* using a single stranded template and a primer (as shown below). The reaction also had DNA polymerase, dNTPs and appropriate buffer.

3'ATGCTGGGCTGCATAGGACCCGAGGCGGGGACCCCATGGATCCAATTAA5'
 5'TACGACCCG3'

On analysing the amplified fragment it was observed that the complete sequence could not be copied. Further analysis showed that short stretches were generated, which stopped at any one of the 'A' on the template strand which generated short stretches of copied strands like:

5' TACGACCCGACGT3'

5'TACGACCCGACGTAT3'

[Question ID = 9437]

1. dideoxyATP (ddATP) along with dATP

[Option ID = 37742]

2. ddATP instead of dATP

[Option ID = 37743]

3. ddTTP along with dTTP

[Option ID = 37744]

4. ddTTP instead of dTTP

[Option ID = 37745]

Correct Answer :-

- ddTTP along with dTTP

[Option ID = 37744]

25) The absorbance of double stranded DNA sample was measured at 260 nm. The DNA sample was taken and incubated at 95°C for 15 minutes to denature it. If absorbance of the sample is again measured at 260 nm it is expected to:

[Question ID = 9438]

1. Remain unchanged [Option ID = 37746]
2. Increase [Option ID = 37747]
3. Decrease [Option ID = 37748]
4. May change, depending upon the concentration of DNA [Option ID = 37749]

Correct Answer :-

- Increase [Option ID = 37747]

26) 0.5 microgram of lambda DNA digested with *HindIII* was loaded onto an agarose gel as a size marker. A band generated from PCR has the same intensity as the 2 Kb band from the lambda *HindIII* digest. What is the approximate amount of DNA of the amplified fragment? [for this problem assume that the size of Phage lambda DNA is 50Kb]

[Question ID = 9439]

1. 01 ng

[Option ID = 37750]

2. 02 ng

[Option ID = 37751]

3. 10 ng

[Option ID = 37752]

4. 20 ng

[Option ID = 37753]

Correct Answer :-

- 20 ng

[Option ID = 37753]

27) In experiments on plant transformation, a researcher wanted to ensure that in all generated transgenic lines only the region between the T-DNA borders is incorporated in the plant genome. In order to do so he has to develop a binary vector which has

[Question ID = 9440]

1. A positive selection marker placed between the T-DNA borders [Option ID = 37754]
2. A negative selection marker placed between the T-DNA borders [Option ID = 37755]
3. A positive selection marker within the T-DNA borders and a negative selection marker outside the border [Option ID = 37756]
4. A negative selection marker within the T-DNA borders and a positive selection marker outside the border [Option ID = 37757]

Correct Answer :-

- A positive selection marker within the T-DNA borders and a negative selection marker outside the border [Option ID = 37756]

28) Of the following radiations, which one is the least penetrating?

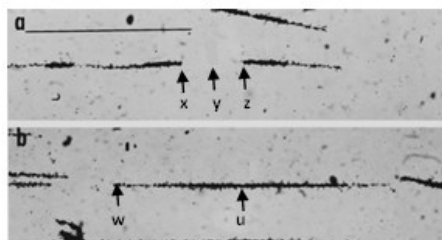
[Question ID = 9441]

1. Alpha [Option ID = 37758]
2. Beta [Option ID = 37759]
3. Gamma [Option ID = 37760]
4. X-rays [Option ID = 37761]

Correct Answer :-

- Alpha [Option ID = 37758]

The picture below shows two DNA autoradiograms of replication units. These are from DNA labeled with a 30-min hot pulse with ^3H -thymidine at 50 Ci/mmol for 30 min (the hot pulse), and then at 5 Ci/mmol, for 30 min (the warm pulse). The bar represents 50 μm .



Based on the grain deposition observed in the two autoradiograms, which of the following statements is correct?

[Question ID = 9442]

1. Autoradiogram 'a' shows unidirectional mode of replication starting with hot pulse at x and y, while 'b' shows bidirectional mode of replication starting with hot pulse at u. [Option ID = 37762]
2. Autoradiogram 'b' shows unidirectional mode of replication beginning with warm pulse at w [Option ID = 37763]
3. Autoradiogram 'a' shows unidirectional mode of replication starting with hot pulse at x and y, while 'b' shows bidirectional mode of replication starting with hot pulse at u. [Option ID = 37764]
4. Both autoradiogram a and b show bidirectional modes of replication. 'a' starts with prepulse at y and 'b' starts with hot pulse at u [Option ID = 37765]

Correct Answer :-

- Both autoradiogram a and b show bidirectional modes of replication. 'a' starts with prepulse at y and 'b' starts with hot pulse at u [Option ID = 37765]

30) Which one of the following techniques can be utilized to study Protein:Protein interaction?

[Question ID = 9443]

1. Fluorescence Recovery after photobleaching (FRAP) [Option ID = 37766]
2. Yeast three hybrid system [Option ID = 37767]
3. Phase display [Option ID = 37768]
4. ChIP-on-chip assay [Option ID = 37769]

Correct Answer :-

- Phase display [Option ID = 37768]

31) Which one of the following plays a major role in preventing polyspermy during sea urchin fertilization?

[Question ID = 9444]

1. Wave of calcium release [Option ID = 37770]
2. Activation of phospholipase C zeta [Option ID = 37771]
3. Formation of fertilization envelope [Option ID = 37772]
4. Depolarization of egg membrane [Option ID = 37773]

Correct Answer :-

- Depolarization of egg membrane [Option ID = 37773]

32) In a cloning experiment, you are inserting a gene of interest into the *LacZ* gene in a vector carrying the ampicillin resistance gene. Transformed *E. coli* with ligation mixtures were plated on media containing ampicillin + X-gal, only ampicillin and only X-gal. Which one of the following results would indicate unsuccessful cloning of the gene of interest?

[Question ID = 9445]

1. White colony on the ampicillin + X-gal plates
[Option ID = 37774]
2. Blue colony on the ampicillin + X-gal plates
[Option ID = 37775]
3. Any colony on the ampicillin + X-gal plates irrespective of color
[Option ID = 37776]
4. Blue colony on X-gal plate which does not grow on ampicillin plates
[Option ID = 37777]

Correct Answer :-

- Blue colony on the ampicillin + X-gal plates
[Option ID = 37775]

33) The mushroom poison α -amanitin interferes with which one of the following cellular processes?

[Question ID = 9446]

1. Protein synthesis [Option ID = 37778]
2. mRNA synthesis [Option ID = 37779]
3. DNA synthesis [Option ID = 37780]
4. RNA interference [Option ID = 37781]

34) Which one of the following statements best describes the function of Hox genes during specification of neuronal fate?

[Question ID = 9447]

1. Different Hox genes are activated along the dorso-ventral axis by the gradient of Shh. [Option ID = 37782]
2. Hox genes determine the identity of the segments along the axis of the vertebrate spinal cord [Option ID = 37783]
3. Different combinations of Hox genes specify the identities of neurons along the antero-posterior axis [Option ID = 37784]
4. Hox genes determine the different subtypes of neurons that form along the dorso-ventral axis [Option ID = 37785]

Correct Answer :-

- Different combinations of Hox genes specify the identities of neurons along the antero-posterior axis [Option ID = 37784]

35) If a radioactive element has a half-life of 2.7 days, how much of a 96 g sample of will be left after 8.1 days?

[Question ID = 9448]

1. 24 g [Option ID = 37786]
2. 12 g [Option ID = 37787]
3. 8 g [Option ID = 37788]
4. 6 g [Option ID = 37789]

Correct Answer :-

- 12 g [Option ID = 37787]

36) Which one of the following statements regarding column chromatography is NOT correct?

[Question ID = 9449]

1. Affinity chromatography involves specific binding of the desired protein with the column matrix or molecules [Option ID = 37790]
2. Gel-filtration chromatography facilitates separation of proteins on their ability to bind to specific groups on the column matrix [Option ID = 37791]
3. In reverse phase chromatography, the desired protein can be selectively eluted by solutions of different hydrophobicities or ionic strengths [Option ID = 37792]
4. Ion-exchange chromatography involves the use of diverse ionic groups attached to the column matrix that specifically bind to the desired protein [Option ID = 37793]

Correct Answer :-

- Gel-filtration chromatography facilitates separation of proteins on their ability to bind to specific groups on the column matrix [Option ID = 37791]

37) Which one of the following is NOT a trinucleotide repeat disorder?

[Question ID = 9450]

1. Huntington's disease [Option ID = 37794]
2. Dentatorubral pallidoluysian atrophy [Option ID = 37795]
3. Spinocerebellar ataxias [Option ID = 37796]
4. Parkinson's disease [Option ID = 37797]

Correct Answer :-

- Parkinson's disease [Option ID = 37797]

38) A female is heterozygous for an allele resulting in haemophilia and for an allele resulting in colour blindness when present in homozygous condition. In case both traits are X linked what can be predicted for the progeny if she marries a normal male?

[Question ID = 9451]

1. Haemophilic and colour blind daughters [Option ID = 37798]
2. All sons and daughters are haemophilia [Option ID = 37799]
3. 50% haemophilic and colour blind sons and 50% colour blind daughters [Option ID = 37800]
4. 50% haemophilic and colour blind sons and 50% normal sons [Option ID = 37801]

Correct Answer :-

- 50% haemophilic and colour blind sons and 50% normal sons [Option ID = 37801]

39) The nuclease that cleaves primary micro RNA to precursor micro RNA is:

[Question ID = 9452]

1. Dicer [Option ID = 37802]
2. Drosha [Option ID = 37803]
3. Argonaute [Option ID = 37804]
4. Ribonuclease H [Option ID = 37805]

Correct Answer :-

- Drosha [Option ID = 37803]

40) In *Caenorhabditis elegans*, the ced-3 and ced-4 proteins are involved in:

[Question ID = 9453]

1. Cell proliferation [Option ID = 37806]
2. Cell differentiation

4. Hypersensitive reaction

[Option ID = 37809]

Correct Answer :-

- Apoptosis

[Option ID = 37808]

41) What is the difference between genetic drift and change due to natural selection?

[Question ID = 9454]

1. Genetic drift never occurs in nature, natural selection does [Option ID = 37810]
2. Genetic drift does not require the presence of variation [Option ID = 37811]
3. Genetic drift does not involve competition between members of a species [Option ID = 37812]
4. There is no difference [Option ID = 37813]

Correct Answer :-

- Genetic drift does not involve competition between members of a species [Option ID = 37812]

42) If a protein is made exclusively of non-polar amino acids, how will it behave on contact with water?

[Question ID = 9455]

1. It will be attracted to water
2. It will be repelled by water
3. It will form a thin membrane on water surface
4. Cannot be predicted

[Option ID = 37814]

[Option ID = 37815]

[Option ID = 37816]

[Option ID = 37817]

Correct Answer :-

- It will be repelled by water

[Option ID = 37815]

43) The physical integration of a transgene can be best demonstrated by:

[Question ID = 9456]

1. Southern blot hybridization [Option ID = 37818]
2. Northern blot hybridization [Option ID = 37819]
3. Karyotyping [Option ID = 37820]
4. Western blot [Option ID = 37821]

Correct Answer :-

- Southern blot hybridization [Option ID = 37818]

44) Solid tumors when exposed to glucose and oxygen, generate ATP via:

[Question ID = 9457]

1. Glycolysis only [Option ID = 37822]
2. Oxidative phosphorylation only [Option ID = 37823]
3. Both glycolysis and oxidative phosphorylation [Option ID = 37824]
4. Neither glycolysis nor oxidative phosphorylation [Option ID = 37825]

Correct Answer :-

- Glycolysis only [Option ID = 37822]

45) *Schizosaccharomyces pombe* cells expressing non-degradable mitotic cyclin will:

[Question ID = 9458]

1. Produce smaller than normal daughter cell because cell division occurs prematurely
2. Easily exit M phase
3. Arrest cells late in mitosis
4. Arrest at G2/M boundary

[Option ID = 37826]

[Option ID = 37827]

[Option ID = 37828]

[Option ID = 37829]

46) A 1.5 ml of a bacterial culture consisting of 10^8 cells/ml was used to inoculate 100 ml of medium and grown to obtain a density of 5×10^7 cells/ml. Approximately, how many generations would the cells have gone through?

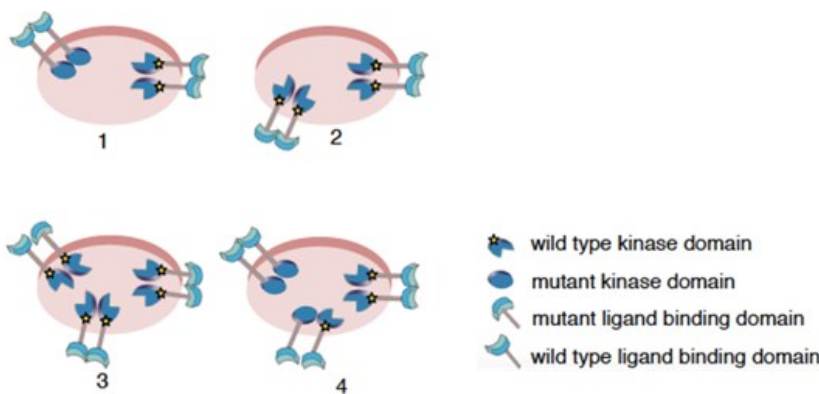
[Question ID = 9459]

1. 1 [Option ID = 37830]
2. 5 [Option ID = 37831]
3. 10 [Option ID = 37832]
4. 15 [Option ID = 37833]

Correct Answer :-

- 5 [Option ID = 37831]

47) Two different mutant forms of Receptor Tyrosine Kinase (RTK) gene were developed. One mutant encodes a protein with a non functional kinase domain, and the other lacks a functional ligand binding domain. These are expressed independently in a normal cell which expresses the wild type RTK from their endogenous gene. It is known that the cells used have a large number of RTK receptors on their surface and that ligands bind to monomeric forms of receptor proteins whereas the heterodimer receptors are inactive in signalling. The diagrams below depict four different cell types identified. Each diagram shows the receptor forms observed on the respective cell types in the ratio that they were observed.



Signalling through RTK pathway was studied in these four cell types. The experiments were performed under nonsaturating concentrations of ligand. The following statements were made:

- i. In type 1 cells, the mutant receptor with the nonfunctional kinase domain will interfere with signaling by the cells' normal RTK.
- ii. In type 2 cells, the mutant RTK lacking functional ligand binding domain will be inactive for signaling, but will not interfere with normal signaling mediated by the cells' own receptor tyrosine kinases.
- iii. Equal levels of signaling will be achieved by type 3 and type 4 cells.
- iv. The effects of mutant RTKs of cell type 2 and cell type 3 on levels of signaling by the cells' own normal RTKs will be the same.

Which of the options below has both the correct statements?

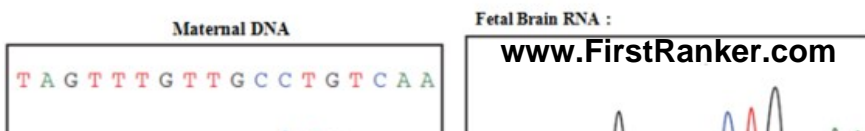
[Question ID = 9460]

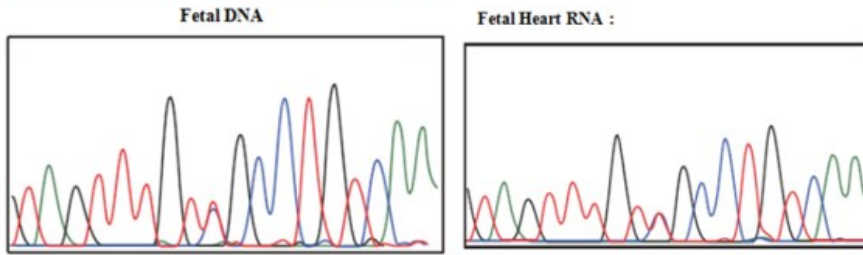
1. (i) and (ii) only
[Option ID = 37834]
2. (ii) and (iii) only
[Option ID = 37835]
3. (i) and (iv) only
[Option ID = 37836]
4. (ii) and (iv)
[Option ID = 37837]

Correct Answer :-

- (i) and (ii) only
[Option ID = 37834]

48) The figure below shows part of a DNA sequence of an autosomal gene X from her mother and her child (fetal). In addition to the genomic DNA, the sequencing data of cDNA from the child is also represented.





Based on the above observations the following conclusions were drawn:

- i. The father is heterozygous for this region
- ii. In the fetal brain gene X is expressed from the maternal chromosome
- iii. In the fetal heart gene X on the paternal chromosome is expressed
- iv. The mother is homozygous for this region

Which of the above conclusions are correct?

[Question ID = 9461]

1. (i), (ii) and (iii)

[Option ID = 37838]

2. (ii), (iii) and (iv)

[Option ID = 37839]

3. (ii) and (iv) only

[Option ID = 37840]

4. (i), (ii), (iii) and (iv)

[Option ID = 37841]

Correct Answer :-

- (i), (ii) and (iii)

[Option ID = 37838]

49) The DNA content of a diploid cell is measured in the G1 phase. After meiosis I, the DNA content of one of the two cells produced would be:

[Question ID = 9462]

1. Equal to that of the G1 cell [Option ID = 37842]
2. Twice that of the G1 cell [Option ID = 37843]
3. One-half that of the G1 cell [Option ID = 37844]
4. One-fourth that of the G1 cell [Option ID = 37845]

Correct Answer :-

- Equal to that of the G1 cell [Option ID = 37842]

50) Pairs of homologous chromosomes:

[Question ID = 9463]

1. Have identical DNA sequences in their genes [Option ID = 37846]
2. Have genes for the same characters at the same loci [Option ID = 37847]
3. Are found in gametes [Option ID = 37848]
4. Separate in meiosis II [Option ID = 37849]

Correct Answer :-

- Have genes for the same characters at the same loci [Option ID = 37847]