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63/2 (SEM-3) BIT 304,305

2021

(held in 2022)

BIOTECHNOLOGY

(Theory Paper)

Paper Code : BIT-304 (New) / BIT-305 (Old)

(Toxicology)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks
for the questions.

1. Answer the following multiple choice questions :
1×6=6

(a) The branch of toxicology which studies the effect of a toxicant in hospitalized patients may be referred as

- (i) Clinical toxicology
- (ii) Forensic toxicology
- (iii) Drug toxicology
- (iv) None of the above

[Turn over

(b) Which one of the following toxicants is known to damage DNA ?

- (i) Nicotine
- (ii) Carcinogens
- (iii) Snake Venom
- (iv) CO

(c) Which one of the following statements is not correct ?

- (i) The target of the toxicant is known as its receptor.
- (ii) Toxicokinetic demonstrates how the body responds to toxicants
- (iii) Intra-muscular injection of a toxicant will produce faster effects than intra-venous injection.
- (iv) All of the above statements are not correct.

(d) The supervisor of Mr. Raju asked him to inject a toxicant into the peritoneal cavity of the mice by following the reference (20 mg of toxicant / kg of body weight of the mice) to study the effect of the toxicant. Note that body weight of the mice to be used for this

study is 20g. Calculate the amount of the toxicant Mr. Raju needs to inject into the mice

- (i) 0.04 mg
- (ii) 0.4 mg
- (iii) 400 kg
- (iv) Both (ii) and (iii) are correct

(e) Mr. Alex was arrested by police in the suspicion of using heroin (Neurotoxicant). In this scenario, police will most likely send Mr. Alex for testing in which one of the following branch of toxicology ?

- (i) Clinical toxicology
- (ii) Forensic toxicology
- (iii) Plant toxicology
- (iv) Chemical toxicology

(f) Which one of the following assays for testing toxicant's effect is cell culture based ?

- (i) MTT assay and Trypan blue assay
- (ii) MTT assay and ELISA
- (iii) Western blotting
- (iv) Only MTT assay and not Trypan blue assay.

2. Write short on the following topics : $2 \times 5 = 10$

- (a) Forensic toxicology and clinical toxicology.
- (b) Biotechnology based solution to reduce the use of chemical pesticides and chemical fertilizers.
- (c) Difference between toxico-kinetic and toxico-dynamic.
- (d) Teratogenic and carcinogenic effects of toxicants.
- (e) LD_{50} and LC_{50} .

3. Answer any six of the following : $6 \times 5 = 30$

- (a) For example, you are assigned an experiment where you need to study the effect of a carcinogen and pollen grains. In these conditions, why and what kind of toxicity test will you perform to study the toxic effects of these toxicants ?
- (b) For instance, you were studying a previously unknown toxicant which showed ability to kill actively growing cells in your experiment. In this condition, what kind of toxicity test will you perform ? Explain the principle of the test briefly.

- (c) Describe how heavy metal causes environmental pollution.
- (d) Describe how chemical pesticides bring negative effects on human health.
- (e) Write about the various sources of environmental toxicant by giving your opinion to reduce the use of these sources.
- (f) Explain dose-response relationship in toxicology by supporting your answer with graphical representation.
- (g) What is therapeutic index and margin of safety in toxicology ?
- (h) Write the names of the class of the toxicant that are known to cause death of the embryo and cancer with two examples of each along with the kinds of toxicity tests can be performed.
- (i) Mr. Raju being a drug addicted individual took intra-venous injection of toxicant called Z and it was observed in the department of forensic toxicology that the toxicant is circulating in his blood. In this scenario, what kind of immunochemical test should be the best one to perform for checking the presence of toxicant Z in the blood of Mr. Raju ?

Write shortly on the principle of the test you have selected.

4. Answer any *two* of the following descriptive and analytical questions : $10 \times 2 = 20$

(a) Mr. Brahma; a research scholar at the University of Bodoland hypothesized that a toxicant called Z induced the expression of genes A and B. The product of these genes is known to kill cells. Therefore, Mr. Brahma was asked by his supervisor to study the expression profile of genes A and B in response to the toxicant Z. Describe in detail about the various types of molecular approach techniques which can be performed by Mr. Brahma to prove his hypothesis.

(b) Describe various types of toxic effects caused due to toxicants.

(c) Describe acute and chronic toxicity test.

5. Answer any *one* of the following essay type questions : $1 \times 14 = 14$

(a) Write in detail on toxico-kinetics.

(b) Write in detail on MATC, Potentiation, Synergism and teratogens.