I.D.#_____ Name _____

University of California, Berkeley
Department of Nutritional Sciences and Toxicology

NST 11, Spring 2016
Introduction to Toxicology

Quiz #1 (Group A)

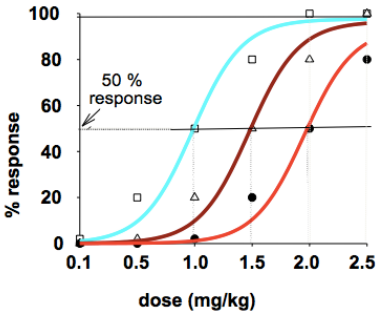
(100 pts. Total)
Answer each question by selecting only one of the possible responses.
Please indicate quiz Group A on the answer sheet.

Questions 1-7: Jessica is a graduate student who isolated 2 chemical compounds, J1 and J2, from an unknown mushroom species she found in Tilden Park. J1 is fat soluble whereas J2 is water soluble. She fed mice with diet mixed with J1, and she found that J1 can reduce inflammation, but higher doses induces immune cell death. These mice initially look sluggish, lose the ability to move, and eventually die. Below is the dose response curve for J1. Please tell Jessica:

1. ED_{50} is a) 1mg/kg body weight, b) 1.5 mg/kg, or c) 2 mg/kg

2. LD_{50} is a) 1mg/kg body weight, b) 1.5 mg/kg, or c) 2 mg/kg

3. NOAEL is a) 0.1mg/kg body weight, b) 0.5 mg/kg, or c) 1 mg/kg



4. Which compounds, J1 or J2, can freely pass through cell membrane?
   a. Neither
   b. Both
   c. J1
   d. J2

5. When J1 enters our body, it shall be metabolized by:
   a. phase I enzyme, such as cytochrome p450, that adds a water tag on it, so it can be easier to be excreted.
   b. phase II enzyme, such as cytochrome p450, that adds a water tag on it, so it can be easier to be excreted.
   c. phase I enzyme, such as cytochrome p450, that adds a chemical hook on it.
   d. phase II enzyme, such as cytochrome p450, that adds a chemical hook on it.
   e. none of the above is correct

6. Jessica wants to make some chemical modifications on J1 to see whether she can develop a "safer" compound to treat inflammatory diseases. Which one of the following properties would give Jessica the greatest confidence about the drug's safety?
   a. A lower TD_{50}
   b. A larger range of doses between the ED_{99} and TD_1
   c. A smaller range of doses between the ED_{99} and TD_1

d. A lower ED_{50}
e. A lower LOEAL

7. Jessica also found that J2 is very toxic. Using rodents as a model, she found that the LD_{50} of J2 is 20mg/g body weight. Which of the following is true about this substance?
a. 10mg/g is lethal to half of the studied population
b. 40mg/g is lethal to all individuals in the studied population
c. 20mg/g is lethal to half of the studied population
d. all of the above
e. none of the above

8. Which following statements from a-d is **incorrect?** If they are all correct, choose "e":
a. Descriptive toxicology usually includes toxicity tests
b. Regulatory toxicology sets rules and assures compliance solely based on toxicity testing results
c. Toxicity tests includes computer-based "*in silico*" approach.
d. All compounds can be toxic, depending on their dose.
e. none of the above.

9. Certain Asian populations tend to develop redness and flushing to their faces when they consume alcohol. This is because:
a. They have one normal and one mutant copy of alcohol dehydrogenase. This Asian population is prone to develop alcoholism.
b. They have one normal and one mutant copy of aldehyde dehydrogenase. This Asian population is prone to develop alcoholism
c. They have one normal and one mutant copy of CYP2E1, This Asian population is prone to develop alcoholism
d. They have one normal and one mutant copy of alcohol dehydrogenase. This Asian population is prone to develop esophageal cancer.
e. They have one normal and one mutant copy of aldehyde dehydrogenase. This Asian population is prone to develop esophageal cancer.
f. They have one normal and one mutant copy of CYP2E1. This Asian population is prone to develop esophageal cancer.

10. Which following statement about alcohol is correct?:
a. Alcohol enhances neurotransmitter GABA actions to stimulate nerve signals in brain
b. Alcohol inhibits neurotransmitter GABA actions to stimulate nerve signals in brain
c. Alcohol enhances neurotransmitter GABA actions to reduce nerve signals in brain
d. Alcohol inhibits neurotransmitter GABA actions to reduce nerve signals in brain,
e. Valium inhibits neurotransmitter GABA actions, so Valium can block alcohol effects in brain.

11. Mary's elder sister is pregnant. She consults Mary regarding to alcohol consumption, because Mary just took NST11, Mary's recommendation should be:
a. Drink beer (only 5% alcohol) but don't drink wine and liquior (12-50% alcohol).
b. One drink is fine as far as eating food in the same time.
c. One drink of wine every day is good for the cardiovascular system.
d. Don't drink any alcohol because safe levels have not been established.
e. Drink some and if she feels uncomfortable, then stop drinking.

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12. Alcohol consumption is highly associated with the development of breast cancer:
    a. Drinking alcohol increases blood estrogen levels that can promote breast epithelial cell proliferation.
    b. Drinking alcohol decreases blood estrogen levels that can promote breast epithelial cell proliferation.
    c. Drinking alcohol increases blood folic acid levels that reduce cell's ability for DNA repair.
    d a and c are correct
    e. b and c are correct

13. What are the mechanisms underlying the effects of caffeine?
    A. Caffeine inhibits adenosine receptor and reduces neural activity.
    B. Caffeine inhibits adenosine receptor and promotes neural activity.
    C. Caffeine activates adenosine receptor and reduces neural activity.
    D. Caffeine activates adenosine receptor and promotes neural activity.
    E. Caffeine inhibits cyclic AMP phosphodiesterase activity to increase cAMP levels in cells.
    F. Caffeineactivates cyclic AMP phosphodiesterase activity to increase cAMP levels in cells.

    a. A and E
    b. A and F
    c. B and E
    d. B and F
    e. C and E

14. Which of the following statements is true about nicotine:
    a. Nicotine can inhibit acetylcholine function at low doses
    b. Nicotine inhibits GABA release to reduce neural activity
    c. Nicotine is only mildly addictive in older women
    d. Nicotine stimulates dopamine release in the brain reward center that causes dependence
    e. Smokers clear nicotine slower than non-smokers, which results in tolerance

15. NAS recommendations for the prevention of cancer include all of the following except:
    a. Minimize consumption of salt-cured and smoked foods.
    b. Reduce fat intake to <30% calories, but increase carbohydrate intake.
    c. Include 6-9 servings per day of fruits, vegetables, and whole grains in the diet.
    e. If you consume alcohol, do so in moderation (1 drink/day for men) and not in combination with smoking.

16. Which of the following statements is correct:
    a. One of the cancer promoters is inflammation, which can cause more mutations in the human genome
    b. The difference between cancer promoters and cancer initiators is the latter causes DNA changes but not the former
    c. Phase II reactions make compounds more water soluble and easier to be excreted. So all compounds through phase II reactions have lower carcinogenic activity
    d. The major determinant for the development of breast cancer is genetics. Therefore, the risk of developing breast cancer in certain populations is the same no matter where they live and what they eat.

e. None of above are correct.

17. Cancer initiation can be caused by the mutation of specific genes:
    a. gain of functions in tumor suppressor genes
    b. gain of functions in oncogenes
    c. lost of functions in tumor suppressor genes
    d. a and c
    e. b and c

18. Which of the following statements is correct:
    a. A neoplasm is heritably altered, relatively autonomous growth that is malignant.
    b. A tumor is a space-occupying lesion that is malignant.
    c. Cancer progression results in the spread of tumor cells to other organs, which usually requires the formation of new blood vessels, a process called: angiogenesis.
    d. Wascular endothelial growth factor (VEGF) is a major player in cancer promotion process.
    e. p53 is one of the most important oncogenes that encodes a protein that can cause cancer.

19. Choose the correct statement from "a"-"d", if all of them are correct, choose "e":
    a. Nitrosamine is a carcinogen that is usually found in contaminated peanuts and corns
    b. Polycyclic aromatic amines (PAA) and polycyclic aromatic hydrocarbons (PAH) generated from fried or broiled meats are common dietary carcinogens
    c. Aflatoxins are mainly in expired hot dogs and sausages.
    d. Increasing angiogenesis can reduce cancer progression and is a potential approach to treat cancer
    e. All of the above are correct.

20. Which of the following statements is correct about neurotransmission:
    a. Axons pass messages away from neuronal cell bodies to other neurons, muscles or glands.
    b. Neural impulse is mediated by electrical signals traveling down the axon.
    c. Synapses are specialized junctions through which neurons signal to each other and to non-neuronal cells, such as those in muscle and glands.
    d. Neurotransmitters are released from the pre-synapse and bind to the receptors in post-synapse to propagate the signal.
    e. All of the above are correct.

21. Which of the following statements are correct:
    a. Hepatic/portal circulation passes substances from gut through portal vein to the pancreas
    b. Lymphatic circulation into blood - passage of substances in the lymph via the thoracic duct to left subclavian vein, which can result in lung specific toxicity from ingested toxins.
    c. Enterohepatic circulation circulate bile acids and drugs from liver to bile, follow by entry to small intestine and then re-absorbed and transport back to liver.
    d. a and b
    e. b and c

22. Which following is true about ethanol?:
    a. Women and the elderly are more sensitive to alcohol on average because of increased body fat.
    b. More than 4 drinks per day for pregnant women have high risks to develop fetal alcohol syndrome, especially if drinking during first trimester.

c. After drinking alcohol about 50% is absorbed to bloodstream through stomach.
d. A standard alcohol drink is 50 gram of ethanol
e. The legal limit of alcohol content in blood in most states is 0.8%

23. Which following is true?:
a. Proteins are polar substances that are usually in blood.
b. Lead is usually stored in bone.
c. Cadmium is usually stored in kidneys
d. Fat soluble compounds usually accumulate in adipose tissue.
e. All of above are correct.

24. Which is the definition of "hormesis":
a. A compound that only exerts beneficial effects at a low dose
b. A compound that exerts toxic effects at a very high dose
c. A compound that exert toxic effects at a low dose but beneficial effects at a high dose
d. A compound that exerts beneficial effects at a low dose but toxic effects at a high dose
e. None of the above

25. Which of the following is correct about the excretion?
a. Mammary gland can excrete water soluble xenobiotics through milk
b. Most unabsorbed substances are excreted through intestines as feces
c. Fat soluble xenobiotics can be excreted through exocrine glands by sweat
d. Metals are mainly excreted from kidney
e. none of the above

26. Which of the following represents the correct order of chemical carcinogenesis?
a. Normal cells exposed to carcinogen-> cells migrate to other tissues -> abnormal cells develop-> tumor formation -> changing the DNA of some cells.
b. Abnormal cells develop-> changing the DNA of some cells -> cells migrate to other tissues -> carcinogen exposure -> tumor formation.
c. Normal cells exposed to carcinogen-> changing the DNA of some cells -> abnormal cells develop -> tumor formation-> tumor cells migrate to other tissues.
d. DNA mutations occur in some cells-> carcinogen exposure-> cells migrate to other tissues-> abnormal cells develop -> tumor formation.
e. None of the above.

27. What is the active component of marijuana?
a. tetrahydrocannabinol (THC)
b. morphine
c. acetylcholine
d. tetrodotoxin
e. cannabidiol

28. What receptor does marijuana bind to elicit its psychoactive effects?
a. acetylcholine receptors
b. opioid receptors

c. THC receptors
d. cannabinoid receptors
e. GABA receptors

29. How does marijuana slow down movement and impair memory?
a. through stimulating acetylcholine receptors and letting sodium into neurons thus exciting neurons
b. stimulating cannabinoid receptors leading to increased chloride influx into neurons and suppressing neuronal excitation and inhibition of PKC signaling to lower AP1 transcription
c. stimulating cannabinoid receptors leading to closing of calcium channels and less release of excitatory neurotransmitters and inhibition of PKA signaling to lower CREB
d. stimulating opioid receptors leading to closing of calcium channels on the postsynapse leading to suppressed neurotransmission
e. THC, due to its hydrophobicity, causes disruptions in cell membrane fluidity on neurons leading to a general impairment in neurotransmission

30. What does Spice consist of and why is it seemingly more dangerous than marijuana?
a. Spice contains pesticides laced in with THC.
b. Spice contains cocaine laced in with higher concentrations of THC.
c. Spice contains synthetic cannabinoids that are more potent than THC.
d. Spice contains morphine coupled with THC with gives a much stronger and more dangerous high.
e. Spice contains much higher concentrations of THC than cannabis sativa giving a much stronger and more dangerous high.

31. What are the two endocannabinoids?
a. acetylcholine and endorphins
b. THC and cannabidiol
c. HU210 and THC
d. 2-arachidonoyglycerol (2-AG) and anandamide
e. gama-aminobutyric acid and THC