

Please remember to choose the **BEST** answer to the following questions.

1. In Canada, how many grams of ethanol would someone consume if they drank 5 standard drinks?
 - A. Less than 50 g
 - B. Less than 100g
 - C. More than 100 g
 - D. More than 200 g
2. The difference between glutamate release and GABA release onto dopaminergic neurons in the VTA in the presence of nicotine is due to which of the following?
 - A. $\alpha 7$ -containing receptors do not desensitize as quickly as $\alpha 4\beta 2$ -containing receptors
 - B. $\alpha 7$ -containing receptors are presynaptic while $\alpha 4\beta 2$ -containing receptors are postsynaptic
 - C. the function of $\alpha 7$ -containing receptors is stimulated by nicotine while the function of $\alpha 4\beta 2$ -containing receptors is inhibited
 - D. activation of $\alpha 7$ -containing receptors results in an increase in cAMP levels while activation of $\alpha 4\beta 2$ -containing receptors results in a decrease in cAMP levels
3. In hippocampal neurons exposed to toluene for 4 days, which of the following is most likely to occur when the function of receptors is measured in the absence of toluene?
 - A. An increased response of GABA-A receptors to GABA
 - B. An increased response of NMDA receptors to glutamate
 - C. An increased response of glycine receptors to glycine
 - D. A decrease in the number of NMDA receptor clusters on hippocampal dendrites
4. What do 1,4-butanediol, γ -butyrolactone and GABA all have in common?
 - A. They can bind to both GABA-A and NMDA receptors
 - B. They can all be converted into molecules that can bind to GHB receptors
 - C. Their production is increased in the hippocampus of alcoholics
 - D. They have all been implicated in benzodiazepine-induced memory loss
5. How does tolfenamic acid reduce hangover symptoms?
 - A. By increasing the level of hydration in cranial blood vessels
 - B. By reducing the outflow of water in the kidney
 - C. By increasing cytokine levels in the brain
 - D. By inhibiting the synthesis of prostaglandins
6. In which stage of ethanol withdrawal does seizure activity occur?
 - A. I
 - B. II
 - C. III
 - D. IV

7. Which of the following statements best describes the relationship between weekly ethanol use and cardiovascular disease?
- A. It increases the risk of death caused by all types of cardiovascular disease
 - B. It increases the risk of death caused by myocardial infarction but not other cardiovascular diseases
 - C. It increases the risk of death caused by most cardiovascular diseases except for myocardial infarction
 - D. It has not been proven to affect the risk of mortality due to cardiovascular disease alone
8. Which of the following traits of inhalants is unique when it comes to depressant agents?
- A. They can cause coma and death
 - B. They act as specific neurotransmitter receptors
 - C. They can be bought legally
 - D. They can cause hallucinations
9. The stimulatory effect of ethanol
- A. Peaks after the sedative effect
 - B. is most often reported as the unpleasant part of drinking ethanol
 - C. is correlated with increased heart rate
 - D. Is mediated through inhibition of GABA-A receptors
10. Which of the following regarding the pharmacokinetics of volatile inhalants is TRUE?
- A. The rate at which they enter the blood is determined by the size of the inhalant molecule
 - B. Fatty tissues with good blood flow tend to receive high concentrations
 - C. Muscle tissue with a good blood supply receives the highest concentrations
 - D. The rate at which they are excreted from the lungs depends almost entirely on the charge of the molecule
11. If ethanol is applied directly to dopamine neurons in the ventral tegmental area, which of the following is most likely to occur?
- A. A change in the pattern of dopamine neuron depolarization from tonic to phasic
 - B. A decrease in the firing rate of dopaminergic neurons
 - C. No change in the firing rate of dopaminergic neurons
 - D. An increase in NMDA receptor activity on the nerve endings of glutamate-releasing neurons
12. Which of the following regarding the effects of inhalants on neurotransmitter receptors is FALSE?
- A. The effect on GABA-A receptors is opposite to the effect on glycine receptors
 - B. They can affect receptors for both excitatory and inhibitory neurotransmitter receptors
 - C. The magnitude of the effects at NMDA receptor function is dependent on the type of subunits present within the receptors
 - D. They can either enhance or inhibit the actions of neurotransmitters at their receptors

13. Which of the following regarding effects caused by humans ingesting ethanol is FALSE?
- A. It is excitatory at low doses
 - B. It acts as a depressant/sedative at high doses
 - C. The depressant/sedative effect peaks at the same time that the blood alcohol concentration of ethanol peaks
 - D. There is a biphasic effect on behaviours
14. How can chronic hexane inhalation results in peripheral axonal damage?
- A. By forming a metabolite that can link adjacent proteins together
 - B. By depleting ATP in nerve endings
 - C. By inhibiting the synthesis of white matter in the brain
 - D. By inhibiting acetylcholine receptors found in muscle junctions
15. A person has a body water volume of 50 litres. They ingest one Canadian standard drink. Prior to any metabolism taking place, what is the BAC of this person?
- A. 0.268%
 - B. 0.027%
 - C. 0.022%
 - D. 0.011%
16. The motor stimulant effects of ethanol at low doses are thought to be primarily mediated via elevation of which neurotransmitter in the ventral striatum?
- A. Glutamate
 - B. GABA
 - C. Serotonin
 - D. Dopamine
17. Which of the following regarding alprazolam (Xanax) is TRUE?
- A. It is less likely to form active metabolites than diazepam (Valium)
 - B. It is a long-acting benzodiazepine
 - C. It does not contain a pendant phenyl group
 - D. It binds to GABA-A receptors that contain both an alpha1 and delta subunit
18. How are mu-opioid receptors involved in the activity of dopamine-releasing neurons originating in the ventral tegmental area?
- A. They increase GABA release when activated
 - B. They decrease glutamate release when activated
 - C. They are found on the cell bodies of dopamine releasing neurons and increase their firing rate when activated
 - D. They hyperpolarize neuronal membranes on GABA-releasing neurons when activated
19. "floppy infant" syndrome occurs as a result of:
- A. Benzodiazepines not being metabolized in the fetal liver
 - B. Inhalants accumulating in fetal brain white matter
 - C. Fetal ethanol exposure
 - D. Low oxygen levels due to high carbon monoxide levels in women who smoke

20. Which of the following is a mechanism by which nicotine is thought to contribute to cancer risk?
- A. By binding to and crosslinking DNA strands
 - B. By modifying lipids so that they are able to covalently modify DNA
 - C. By promoting the activity of caspase enzymes
 - D. By inhibiting apoptosis in cells with damaged DNA
21. Which of the following regarding the effects of ethanol in mice models that reflect the human third trimester of fetal development is TRUE?
- A. Chronic, but not binge, exposure can result in massive cell death
 - B. Cell death occurs in the prefrontal cortex but not in other brain regions
 - C. The number of neurons that die are sufficient to result in a decrease in the weight of the whole brain
 - D. The severity of neuronal death is linked to total dose to which the neurons were exposed during the time period rather than peak concentration
22. How can benzodiazepines cause an increase in the activity of dopaminergic neurons in the ventral tegmental area?
- A. By increasing the release of glutamate from glutamatergic neurons
 - B. By increasing the effects of GABA at GABA-A receptors on GABA-releasing neurons
 - C. By increasing the effects of GABA at GABA-A receptors on dopamine-releasing neurons
 - D. By decreasing the effects of glutamate at NMDA receptors on GABA-releasing neurons
23. Transforming growth factor beta (TGF- β) plays a significant role in which of the following processes?
- A. Nicotine-induced changes in nicotinic acetylcholine receptors
 - B. Bone marrow suppression in inhalant abusers
 - C. Benzodiazepine-induced memory loss
 - D. Production of collagen in ethanol-induced cirrhosis of the liver
24. Inhalant-induced "sudden sniffing death" is thought to be a result of which of the following?
- A. Inhibition of GABA-A receptors in the brain stem
 - B. Stimulation of NMDA receptors in the airway smooth muscle
 - C. Inhibition of voltage-activated sodium channels in the heart
 - D. Stimulation of glycine receptors in the spinal cord
25. By constructing lines of mice engineered to have mutations in one specific GABA-A receptor alpha subunit so that they do not bind to benzodiazepines, what have scientists found out about the clinical effects of benzodiazepines?
- A. That receptors containing alpha-5 subunits are mostly responsible for amnesia-inducing properties of benzodiazepines
 - B. That receptors containing alpha-4 subunits are mostly responsible for addiction to benzodiazepines
 - C. That receptors containing alpha-3 subunits are mostly responsible for the sedative effects of benzodiazepines
 - D. That receptors containing alpha-2 subunits are mostly responsible for the anxiolytic properties of benzodiazepines

26. How is ethanol metabolism linked to the production of reactive oxygen species (ROS)?
- A. Alcohol dehydrogenase metabolizes ethanol into aldehyde and molecular oxygen
 - B. When ethanol increases dopamine receptor activation, it triggers an increase in an enzyme that synthesizes ROS
 - C. ROS are produced as a by-product of an enzymatic reaction in which molecular oxygen is used to metabolize ethanol
 - D. Ethanol metabolism produces a by-product that increases the absorption of oxygen in the small capillaries in the liver
27. Which of the following is TRUE regarding the structure of alprazolam (Xanax)
- A. It contains a triazole group
 - B. Unlike "true" benzodiazepines, it does not have a pendant phenyl group
 - C. It lacks the 7-membered ring that is typical of other benzodiazepines
 - D. Its rapid metabolism is due to the presence of a hydroxyl group on the seven-membered ring
28. If someone was to drink methanol and then be given fomepizole, which of the following would be most likely to occur?
- A. The rate of the formation of formaldehyde would decrease
 - B. Aldehyde dehydrogenase would no longer be functional
 - C. There would be a rapid increase in methanol concentration in the blood
 - D. The rate of formic acid excretion in the urine would increase
29. At high pH levels, what is the predominant form of nicotine?
- A. Nonprotonated
 - B. Monoprotonated
 - C. Diprotonated
 - D. Triprotonated
30. Where does the acetaldehyde found in cigarette smoke come from?
- A. The combustion of sugars
 - B. It is a naturally occurring chemical in tobacco plant leaves
 - C. It is added to tobacco to give the tobacco a certain flavour
 - D. It is produced when bacteria in the upper digestive tract metabolize nicotine that is in cigarette smoke
31. Based on the approximate number of grams of ethanol that an average person can metabolize in an hour, what percentage of ethanol would be remaining in the person's system five hours after they consumed 100 grams of ethanol?
- A. More than 75%
 - B. More than 50%
 - C. Less than 25%
 - D. More than 10%

32. When nicotine acts at the $\alpha 4\beta 2$ nicotinic acetylcholine receptor
- A. It only has an effect if acetylcholine is also present
 - B. It binds at the interface between the lipid bilayer and transmembrane domains of the receptor subunits
 - C. It binds to the same binding site as acetylcholine
 - D. It increases the amount of positively charged ions that can pass through its integral ion channel
33. How does ethanol cause heterotopias?
- A. By causing neuronal cell death in the prefrontal cortex
 - B. By interfering with neuronal migration
 - C. By increasing the activity of the thyroid hormone receptor gene
 - D. By increasing acetate levels in the brain
34. Why do smokers report that the first cigarette of the day is often the most pleasurable and/or has the biggest effects?
- A. Their liver is able to metabolize nicotine more quickly after a period of smoking abstinence
 - B. Nicotine reaches the brain more quickly after a brief abstinence from smoking
 - C. Nicotinic receptors are in their least desensitized state
 - D. Dopamine receptors are in their most sensitive state due to recovery from desensitization in the overnight period
35. Why is drinking bourbon more likely to cause a more severe hangover than drinking vodka containing an equivalent amount of ethanol?
- A. Bourbon is more likely to induce metabolic enzymes in the brain and liver
 - B. Bourbon has a higher dose of ethanol per volume than vodka
 - C. Bourbon has a higher rate of absorption than vodka
 - D. Bourbon contains more congeners than vodka
36. How can toluene metabolism lead to acidosis?
- A. Via production of hippuric acid
 - B. Via production of H^+ ions during metabolism by P450 enzymes
 - C. Via bicarbonate ions produced by toluene metabolism in the liver
 - D. Via production of glycolic acid
37. Which of the following chemicals, linked to destruction of lung tissue, has been found in e-cigarettes?
- A. Benzene
 - B. Toluene
 - C. Diacetyl
 - D. Nitrosamine

38. Which of the following statements is TRUE?
- A. Given an equal amount of ethanol, the brains of heavy drinkers tend to use less glucose as an energy source than non-drinkers
 - B. Ethanol is a poor energy source but can lead to weight gain simply because of the amount that alcoholics ingest
 - C. Acetaldehyde is the primary source of energy in neurons of heavy drinkers
 - D. A low ratio of glucose:acetaldehyde triggers the use of ethanol as an energy supply in the brains of heavy drinkers
39. In animal models in which rodents are exposed to e-cigarette vapour for two weeks, which of the following effects was reported?
- A. Down-regulation of dopamine D2 receptors
 - B. Increased lung cell membrane lipid damage
 - C. Decreased macrophage levels
 - D. Fibrosis
40. Which of the following statements regarding nicotine in a single cigarette is TRUE?
- A. The smoke from a single cigarette contains enough nicotine to be lethal to an adult non-smoker
 - B. One cigarette does not contain enough nicotine to desensitize neuronal nicotinic receptors
 - C. The smoke from a single cigarette contains enough nicotine to bind to the majority of $\alpha 4\beta 2$ nicotinic receptors in the brain
 - D. The nicotine found in cigarette smoke primarily affects nicotinic receptors containing either a gamma or delta subunit
41. Why is propranolol used to treat people undergoing withdrawal from ethanol?
- A. To prevent seizures
 - B. To act as a partial agonist at GABA-A receptors
 - C. To inhibit alcohol dehydrogenase
 - D. To slow heart rate
42. When using dermal patches to administer nicotine as part of nicotine replacement therapy, which of the following is TRUE?
- A. Within two hours, it reaches an equivalent plasma nicotine concentration to that reached by smoking a cigarette
 - B. The time it takes to reach a peak plasma concentration is roughly equivalent to that achieved by using nicotine gum
 - C. It is slower than using a nasal spray to reach its highest plasma nicotine concentration
 - D. More than 50% of it is metabolized by the liver
43. In animals that have been exposed to ethanol, what has been shown to counteract the effects that subsequent exposure to nicotine has on dopamine levels in the nucleus accumbens?
- A. Administration of a drug that prevents retinoic acid from binding to its receptor
 - B. Administration of a drug that prevents glucocorticoids from binding to their receptor
 - C. Administration of a drug that prevents nicotine from being metabolized into active metabolites
 - D. Administration of a drug that binds to and activates $\alpha 4\beta 2$ -containing neuronal nicotinic receptors

44. With hangovers:
- The symptoms are strongest when there is no detectable ethanol in the blood
 - The symptoms are strongest during the rising phase of blood alcohol concentrations
 - The symptoms are purely physiological
 - There is no effect on the ability for people to complete complex tasks
45. How does varenicline (Champix) affect neuronal nicotinic receptors?
- It is a presynaptic $\alpha 7$ neuronal nicotinic receptor blocker
 - It is an antagonist at $\alpha 4\beta 2$ -containing neuronal nicotinic receptors
 - It causes a partial activation of $\alpha 4\beta 2$ -containing neuronal nicotinic receptors
 - It causes the rapid desensitization of $\alpha 7$ neuronal nicotinic receptors
46. Why do liver cells of alcoholics start to accumulate more lipids than in non-alcoholics?
- They experience an upregulation of CYP enzymes in hepatocytes
 - They have a high ratio of NADH:NAD⁺
 - The mechanism for storing fat in liver cells is triggered by high alcohol dehydrogenase activity
 - Liver inflammation results in low levels of ATP, which prevents the use of fatty acids as an energy source
47. What effects does nicotine have on cancer cells grown in culture?
- It causes an increase in DNA cross-linking
 - It decreases their survivability rate
 - It increases the rate of formation of reactive oxygen species
 - It increases their growth rate
48. In the brain tissue of fetal monkeys exposed to ethanol, which of the following has been linked to an increased number of neurons undergoing apoptosis?
- Increased ERK phosphorylation
 - Activation of caspases 3 and 9
 - A high NAD⁺:NADH ratio
 - Downregulation of NMDA receptors
49. How does exposure to benzo[a]pyrene increase cancer risk?
- It induces cell proliferation in cells that normally have a short life span
 - It is metabolized into a reactive epoxide
 - It increases the rate of apoptosis in cells with DNA damage
 - It binds to nicotinic receptors on mitochondria in damaged cells
50. In the developing brains of animal models, neuronal death caused by ethanol most closely resembles the pattern of neuronal cell death caused by which of the following?
- A CYP2D6 inhibitor and an alcohol dehydrogenase inhibitor
 - An alcohol dehydrogenase inhibitor and aldehyde dehydrogenase inhibitor
 - A mixture of phenobarbital and MK-801
 - A mixture of drugs that inhibit GABA-A receptors and activate NMDA receptors