

高雄醫學大學 100 學年度學士後醫學系招生考試試題

科目:英文

考試時間: 80 分鐘

說明:一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。  
二、非選擇題限黑色或藍色墨水之鋼筆、原子筆或中性筆，在「答案卷」上作答。  
三、試題、答案卡及答案卷必須繳回，不得攜出試場。

I. Vocabulary. 20 points

A. Please choose the **best** answer to match with each **underlined** word.

【單選題】每題 1 分，共 20 題，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

- Angelina knew that she needed to **intervene** in the argument between her father and her sister, but she was afraid they would turn their anger on her instead.  
(A) regulate (B) interfere (C) appreciate (D) appraise (E) verify
- An ice cream shop in Taichung has the most **bizarre** flavors- bitter gourd and pork jerky, among others.  
(A) ethnic (B) original (C) successive (D) peculiar (E) natural
- Students will learn more when they are in classes out of choice, rather than out of **coercion**.  
(A) compulsion (B) acknowledgement (C) suspension (D) encouragement (E) curiosity
- Mr. Johnson felt some **apprehension** about hiring Helen because she had little experience in sales.  
(A) destination (B) neutrality (C) comprehension (D) despair (E) misgivings
- Advertising hype can easily attract **gullible** consumers.  
(A) naïve (B) crisp (C) credible (D) competent (E) plausible

B. Please choose the **best** answer to complete each sentence.

- Computerization may \_\_\_\_\_ the delivery of goods for regular customers.  
(A) terminate (B) obfuscate (C) promote (D) expedite (E) fatigue
- The administration in that company is \_\_\_\_\_ and corrupt.  
(A) affordable (B) enormous (C) inefficient (D) disappointed (E) pragmatic
- Hotel employees complain that male guests sometimes mistake their friendliness and smiles—which are job requirement—as \_\_\_\_\_.  
(A) hospitality (B) connivance (C) flirtation (D) concinnity (E) concierge
- The suspect was \_\_\_\_\_ by the police for details about the crime.  
(A) arrested (B) interrogated (C) speculated (D) slain (E) persecuted
- The only \_\_\_\_\_ on my job is that I could not leave whenever I desire.  
(A) variable (B) alternative (C) integration (D) hesitation (E) constraint
- “\_\_\_\_\_ for all” is generally the policy adopted by some regimes to contain rebellion.  
(A) Amnesty (B) Tenure (C) Temerity (D) Alternative (E) Punctuation
- Unless they \_\_\_\_\_ their stock immediately, they would run out of everything.  
(A) confiscated (B) replenished (C) perused (D) isolated (E) demanded
- Plants are usually mistaken for \_\_\_\_\_ objects but in fact they have life of their own.  
(A) uncivilized (B) inanimate (C) miscellaneous (D) perennial (E) lasting
- There are always people who are stubbornly \_\_\_\_\_ to change.  
(A) resistant (B) insistent (C) competitive (D) dominant (E) subsistent
- New deadly disease strains will be \_\_\_\_\_, and when they strike, ordinary tests will not detect them.  
(A) involving (B) evolving (C) resolving (D) devolving (E) revolving
- A man who mistook his wife for a hat but who could tell the difference between them might have a neurological condition called \_\_\_\_\_ agnosia.  
(A) aesthetic (B) associative (C) referent (D) lexical (E) analogical

17. Since my husband does not like opera, we only go \_\_\_\_\_.  
 (A) in the long run (B) for the time being (C) once in a blue moon (D) more often than not (E) in no time
18. \_\_\_\_\_ studies show that some forms of alternative medicine are extremely effective.  
 (A) Experienced (B) Engaged (C) Eligible (D) Empirical (E) Elevated
19. Shortly before the crash, the pilot had reported a \_\_\_\_\_ of the aircraft's navigation system.  
 (A) malfunction (B) miscarriage (C) misconduct (D) discharge (E) disorientation
20. The \_\_\_\_\_ cause of World War I was the assassination of an Austrian archduke.  
 (A) principle (B) principal (C) pragmatic (D) primitive (E) prompt

## II. Grammar and Structure. 20 points

### A. Please choose the best answer to complete the sentence.

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21. Michelle Obama, the most recognizable woman in the world, is said to routinely duck reporters to have \_\_\_\_\_ a "normal" life.  
 (A) what calls (B) what has been called (C) what she calls  
 (D) what she has called (E) what she has been called
22. The official word from hotel operators concerning hotel etiquette is that they don't condone inappropriate behavior \_\_\_\_\_.  
 (A) on promises (B) in their promise (C) on premise (D) on their premises (E) in their premises
23. \_\_\_\_\_ you understand this rule, you'll have no further difficulty.  
 (A) Hardly (B) Scarcely (C) Once (D) Unless (E) Not that
24. \_\_\_\_\_ diligently you may study, you cannot master English in a month.  
 (A) Neither (B) Either (C) Hardly (D) Whatever (E) However
25. With the outbreak of SARS, a lot of people who \_\_\_\_\_ a flu dared not go see a doctor.  
 (A) corresponded with (B) came down with (C) checked off (D) lived through (E) contracted with
26. Internationals are allowed to stay in the United States for as long as \_\_\_\_\_ as a full-time student in an educational program and making normal progress toward completing their course of study.  
 (A) they are enrolled (B) they enrolled  
 (C) they have been enrolled (D) enrolling (E) enrolling themselves
27. While a large vocabulary is certainly a sign of learning, it \_\_\_\_\_ how smart a person might actually be.  
 (A) takes one's bearings in (B) is beyond all bearings as  
 (C) is in all his bearings on (D) loses one's bearing on (E) has no bearing on
28. I tried very hard, but I couldn't make myself \_\_\_\_\_.  
 (A) understanding (B) to understand (C) understand (D) understood (E) to be understood
29. \_\_\_\_\_ my opponent, I believe that city funds should be used to build a new hospital.  
 (A) In contrast to (B) Beside (C) Instead of (D) Just as (E) On account of
30. Any political figure \_\_\_\_\_ for president will not succeed without a large quantity of campaign money contributed by wealthy benefactors.  
 (A) intent on running (B) intending on running  
 (C) who intends on running (D) who have the intention of running  
 (E) who intents to run

### B. For each sentence, please choose one underlined part that contains faulty English.

31. Some business analysts argue that the American automobile industry is suffering because Congress will not impose heavier import duties, but others say that the cars themselves are inferior than foreign competition.  
 A B C  
 D E
32. The man avoided, by turning suddenly into a driveway, to hit the child riding a tricycle across the street.  
 A B C D E
33. It was King Louis XIV who had the magnificent Palace of Versailles build; however, the cost was so great that the people of France were angered.  
 A B C D  
 E



44. The author's tone is \_\_\_\_\_.  
(A) ironical (B) sarcastic (C) subjective (D) objective (E) indifferent
45. According to the passage, the word episodic means \_\_\_\_\_.  
(A) constant (B) periodic (C) suicidal (D) uncontrollable (E) self-conscious

Scientists long believed that dependence on fossil fuels, for all its problems, would offer one enormous benefit.

Carbon dioxide is also the primary fuel for plant growth. Using the energy from sunlight, they convert carbon in the air into energy-dense compounds like glucose. All life runs on these compounds. Humans have raised the level of carbon dioxide in the atmosphere by 40 percent since the Industrial Revolution, and are on course to double or triple it this century. Studies have long suggested that the extra gas would supercharge the world's food crops.

But many of those studies were done in artificial conditions. For the past decade, scientists at the University of Illinois have been putting the "CO<sub>2</sub> fertilization effect" to a real-world test. They planted soybeans in a field, then sprayed extra carbon dioxide from a giant tank. They hoped the gas might bump yields as much as 30 percent. At harvest, the bump was only half as large. Their tests on corn, America's most valuable crop and the basis for its meat production and its biofuel industry, were even worse. There was no bump. Their work and that of others suggests that extra carbon dioxide does act as plant fertilizer, but that the benefits are probably less than needed to avert food shortages. Other recent evidence suggests that longstanding assumptions about food production on a warming planet may have been too optimistic.

Two economists, Wolfram Schlenker of Columbia University in New York and Michael J. Roberts of North Carolina State University, have compared crop yields and natural temperature variability at a fine scale. Their work shows that when crops are subjected to temperatures above a certain threshold—about 29 degrees Celsius for corn and 30 degrees Celsius for soybeans—yields fall sharply. This suggests that in some climates, with more scorching days, some crop yields could fall by 30 percent or more.

A paper by David B. Lobell of Stanford University in California and Dr. Schlenker suggests that temperature increases in France, Russia, China and other countries are already suppressing crop yields. "I think there's been an under-recognition of just how sensitive crops are to heat," Dr. Lobell said. Such research is controversial. The findings go beyond those of a 2007 report by the United Nations' Intergovernmental Panel on Climate Change, which found that while climate change was likely to pose severe challenges for agriculture in the tropics, it would probably be beneficial in some of the chillier regions of the Northern Hemisphere, aided by the carbon dioxide effect. At the University of Illinois, a leading scientist behind the work there, Stephen P. Long, sharply criticized the report. "I felt it needed to be much more honest in saying this is *our best guess at the moment*, but there are probably huge errors in there," he said.

(Source: Excerpted from *New York Times*)

46. Which of the following statements best represents the main idea of this passage?  
(A) Fossil fuels could offer enormous benefit. (B) Carbon dioxide helps bump crop yields.  
(C) Carbon dioxide affects climate change. (D) Climate change and crop yields are closely related.  
(E) Carbon dioxide effect could help chillier regions to produce more crops.
47. According to the passage above, which of the following statements is **TRUE**?  
(A) Humans might have raised the level of carbon dioxide by 40% in this century.  
(B) All life runs on fossil fuels.  
(C) Some plants convert carbon into glucose.  
(D) Extra gas could always supercharge food crops.  
(E) Plant growth depends more on fossil fuels than on gas.
48. Scientists in the above passage suggest that \_\_\_\_\_.  
(A) the use of fertilizers could affect level of carbon dioxide  
(B) plant growth is dependent on climate change  
(C) spraying extra carbon dioxide helps plant growth  
(D) crops are very sensitive to heat  
(E) to bump crop yields we need more researches

49. In the passage above, the studies of economists suggest that \_\_\_\_\_.  
 (A) crop yields and natural temperature should not be linked together  
 (B) too much temperature increase suppresses crop yields  
 (C) 30 degrees Celsius is the threshold for the growth of soybeans  
 (D) with more scorching days crop yield increase could be expected  
 (E) France and China suffer from temperature increases
50. What is implied by the phrase *our best guess at the moment* in the last paragraph of the passage above?  
 (A) Climate change was aided by the carbon dioxide effect.  
 (B) Climate change was likely to pose severe challenges for agriculture in the tropics.  
 (C) Climate change aided by the carbon dioxide effect is probably beneficial in some of the chillier regions of the Northern Hemisphere.  
 (D) Climate change reduces the dependence on fossil fuels.  
 (E) Economists are no equal to scientists in terms of climate change.

Jell-O Gelatin looks as cool and appetizing in everyday family desserts as it does in dazzling party creations. But the true beauty in these family desserts is the fun and ease you'll have in making and in serving them.

You can make each serving of dessert special. Set aside several servings of plain gelatin to chill for the “purists” in the family, then add chopped fruit or nuts to the remainder of servings. Toppings and garnishes can be added separately, too. Try an ice cream topping for your active young second baseman, or a sprinkle of chopped mint leaves for his waistline-watcher father.

Just watch those smiles when you serve such family desserts as Fruit Refresher or Double Orange Whip. Ordinary to make, yet out-of-the-ordinary to eat. Jell-O Gelatin--the uncomplicated dessert pleaser for everyone in your family.

(Source: Jell-O Gelatin Advertisement)

51. With what will the "purists" want their jello to be made?  
 (A) Chopped fruit and nuts. (B) Ice cream. (C) Chopped mint leaves.  
 (D) Orange whip. (E) None of the above.
52. What does the speaker in the above passage want to convince the reader to do?  
 (A) Eat more jello. (B) Realize that jello is well-liked by everyone.  
 (C) Serve jello in many different ways. (D) Prepare jello in ordinary ways.  
 (E) Know all the above.
53. To whom is the above passage most likely addressed?  
 (A) Restaurant chefs. (B) Children who like desserts.  
 (C) The family cook (mom especially). (D) Readers reading the recipes. (E) None of the above.

It was a fine day in early spring. Bright sunshine flooded the street where a group of boys in Sunday clothes were playing ball. In most of the tenements the windows were up. Clean-shaven men in collarless shirts or in underwear, women with aprons or sloppy pink wrappers leaned on the sills and gazed with aimless interest at the street, the sky, those who were passing below. Thus they would spend most of every Sunday morning through the coming summer and now, in the first flush of mild weather, **they had already taken up their posts**. The street rang with the animated bickerings of the boys at their games, with the click of a girl's shoes as she skipped rope, with the muted sounds of a dozen unseen radios.

Into this familiar scene came a sudden **intruder**: an odd-looking ambulance with glazed windows. It turned into the street quietly, moved along slowly as the driver searched for a number, and then came to a stop before a rooming house—a drab, four-story building of yellowish, soot-stained brick. In the tenement windows above all eyes turned to the ambulance. On the street all games stopped and, in an instant, the ambulance was surrounded by children.

Those who knew why it had come told the others. An hour earlier there had been a police car and, still earlier, two men from the gas company. The odor of gas emanating from the building had been so strong that it had made church-goers sniff as they passed by on the street.

Up above now, in the open windows of the surrounding tenements, new faces had appeared, and eyes were *riveted* on the doorway of the yellow brick building. No one talked, no one moved away, and no one came down. When the two men in the front seat of the ambulance stepped out and walked into the house, one of the boys, a wiry, sallow-faced, blond lad, jerked his thumb and murmured softly to the others: “Oh, mamma, ain't they got the job?” “They'll be carrying you down some day, Shorty,” a stoutish lad commented with an attempt at humor.

(Source: Adapted from *Sunday Morning on Twentieth Street*)

54. According to the passage above, which of the following is **NOT** the thing people would do to spend their Sunday morning?  
 (A) Playing ball. (B) Watching people passing below.  
 (C) Gazing at the sky. (D) Leaning on the sills and watching aimlessly.  
 (E) Looking at the streets disinterestedly.
55. In Line 5, what is the meaning of the sentence “they had already taken up their posts?”  
 (A) They had already gathered the mails sent to them.  
 (B) They had already taken their positions to fight.  
 (C) They had already started the jobs.  
 (D) They had already started doing this.  
 (E) They had already accepted the positions.
56. According to the passage above, which of the following descriptions is **WRONG**?  
 (A) All the story happened on a spring Sunday.  
 (B) Men as well as women were interested in what was happening in the street.  
 (C) Children were playing and arguing with each other.  
 (D) A dozen unseen radios were playing with sounds easily heard.  
 (E) Most tenement windows were pulled up.
57. Who does the “intruder” mentioned in Paragraph 2 refer to?  
 (A) The ambulance driver. (B) The ambulance itself.  
 (C) The stretcher bearer. (D) The tenement holder.  
 (E) The police who came earlier.
58. In Paragraph 4, what does the word “riveted” mean?  
 (A) rivaled strongly (B) stretched firmly  
 (C) fixed firmly (D) cast heavily (E) roamed aimlessly
59. According to the passage above, which of the following descriptions is **WRONG**?  
 (A) The ambulance moved into the neighborhood quietly.  
 (B) All the neighborhood seemed interested in the coming of the ambulance.  
 (C) The ambulance stopped at a brick house.  
 (D) All eyes were on the ambulance.  
 (E) Children were surrounded by the ambulance.
60. What does the sentence “They’ll be carrying you down some day, Shorty” imply?  
 (A) Accidents could happen to anyone. (B) All will die some day.  
 (C) All will be carried away by the ambulance. (D) Only those in collarless shirts will be carried down.  
 (E) The two men from the ambulance will carry Shorty down some day.

**IV. Essay Writing. Please write in at least 200 words a well-organized essay arguing for or against the notion of “Priority Seats.” 20 points.**

# 高雄醫學大學 100 學年度學士後醫學系招生考試試題

科目:普通生物學

考試時間: 80 分鐘

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1. If the amount of enzyme in a reaction with an initial  $\Delta G$  of -5 kcal/mole was doubled, what would the  $\Delta G$  be?  
(A) -2.5 kcal/mole (B) -5 kcal/mole (C) -10 kcal/mole (D) +5 kcal/mole (E) +10 kcal/mole
2. Which is the most common route through which a protein is secreted from a eukaryotic cell?  
(A) plasmid→plasma membrane→nuclear envelope→smooth endoplasmic reticulum (ER)  
(B) Golgi apparatus→lysosome→vesicles→plasma membrane  
(C) nuclear envelope→vesicles→Golgi apparatus→plasma membrane  
(D) rough endoplasmic reticulum→Golgi apparatus→vesicles→plasma membrane  
(E) rough endoplasmic reticulum→lysosomes→vesicles→cell membrane
3. Movement of integral membrane proteins between the apical and basolateral domains of an epithelial cell membrane is restricted by the presence of  
(A) lipid rafts. (B) basal lamina. (C) desmosomes. (D) tight junctions. (E) gap junctions.
4. Which of the following statements about feedback inhibition in metabolic pathways is most correct?  
(A) The product of the pathway inhibits its own production by competitively binding to reactants in the metabolic pathway.  
(B) The product of the pathway inhibits its own production by noncompetitively binding to reactants in the metabolic pathway.  
(C) The product of the pathway inhibits its own production by competitively inhibiting the binding of a substrate to the active site of an enzyme within the metabolic pathway.  
(D) The product of the pathway inhibits its own production by noncompetitively inhibiting the binding of a substrate to the active site of an enzyme within the metabolic pathway.  
(E) All of the above
5. Which is **NOT** a microtubule-organizing center (MTOC)?  
(A) centrosome (B) basal body of cilia (C) mitotic spindle pole (D) kinetochore (E) all of the above
6. An mRNA sequence is 5'-AUG-GGC-ACU-CAU-ACU-UAA-3', where AUG is the start codon and UAA is the stop codon. How many distinct aminoacyl-tRNA synthetases are required to translate the mRNA sequence?  
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6
7. Self-splicing of group II introns is similar to nuclear pre-mRNA splicing because  
(A) both need snRNPs. (B) both need guanosine. (C) both need ATP. (D) both form lariat structure.  
(E) both form spliceosome.
8. Assuming a fat molecule can be oxidized into 2 glycerol molecules, which are then converted to glyceraldehyde-3-phosphate in intermediate glycolysis, how many ATP can be produced from a fat molecule?  
(A) 4 (B) 8 (C) 24 (D) 36 (E) 48
9. Which of the following proteins is **NOT** a component of focal adhesions?  
(A) cadherins (B) integrins (C) actin filaments (D) linker protein (E) fibronectin/collagen
10. Why is there a need to produce Okazaki fragments on the lagging strand, but **NOT** on the leading strand of DNA?  
(A) It is substantially more efficient to make several shorter strands rather than one longer strand of DNA.  
(B) The two parental strands of DNA are antiparallel and DNA polymerase makes DNA in the 5' to 3' direction only.  
(C) There lacks enough DNA ligase for bonding Okazaki fragments together if they were produced from both parental strands.  
(D) By having one leading strand and one lagging strand the cell can limit the amount of DNA polymerase used for chromosomal replication.  
(E) It is faster to make several smaller fragments than one larger fragment.
11. When observing the skeleton of a snake, you see the remains of hip and hind leg bones associated with four legged animals. These bones are called  
(A) convergent traits. (B) vestigial structures. (C) homologous structures. (D) analogous structures.  
(E) both homologous and analogous structures.

12. The group of protists to which humans are most closely related is:  
 (A) Rhizaria. (B) the choanoflagellates. (C) slime molds. (D) Foraminifera. (E) Stramenopila.
13. Which of the following is **NOT** a defining trait of the phylum Chordata?  
 (A) notochord (B) dorsal hollow nerve cord (C) pharyngeal slits (D) post anal tail  
 (E) protostome development
14. The physiologist J. Soum surgically sealed off an air sac of a pigeon and injected carbon monoxide into it. What did he observe and conclude from this experiment?  
 (A) The bird died demonstrating the toxicity of this gas.  
 (B) The bird was fine, demonstrating this gas is not actually toxic.  
 (C) The bird died, indicating diffusion of gases across the air sac into the blood.  
 (D) The bird showed no ill effects, indicating diffusion of gases from the air sac into the blood.  
 (E) The bird showed no ill effects, indicating gases do not diffuse from the air sac into the blood.
15. Humans cannot survive at sea by drinking salt water. However, marine vertebrates such as sea turtles and various sea birds can survive by drinking salt water. What **DO** they have that humans **DO NOT**?  
 (A) kidneys that are extremely good at producing a concentrated urine.  
 (B) body fluid concentrations that are similar to or greater than those of seawater.  
 (C) the ability to secrete salts and wastes into their intestinal contents like an insect.  
 (D) They use ammonia as their primary nitrogenous waste.  
 (E) salt glands.
16. Which of the following is **NOT** a feature of apoptosis?  
 (A) formation of apoptotic body (B) DNA fragmentation (C) cell swelling (D) activation of caspases  
 (E) release of cytochrome C from mitochondria
17. A nonsense suppressor tRNA may have the anticodon  
 (A) 5'-CAU-3' (B) 5'-UAA-3' (C) 5'-UUA-3' (D) 5'-CCC-3' (E) 5'-UAG-3'
18. Which of the following accurately gives the distribution of phenotypes produced from a cross of purple dwarf pea plants that are heterozygous for flower color and plant height?  
 (A) 27 purple dwarf; 28 purple tall; 31 white dwarf; 29 white tall  
 (B) 63 purple dwarf; 28 purple tall; 27 white dwarf; 7 white tall  
 (C) 132 purple dwarf; 138 white tall  
 (D) 54 purple dwarf; 6 white tall  
 (E) 100% purple dwarf
19. Which of the following components and conditions increases membrane fluidity?  
 (A) phospholipids with long, saturated fatty acyl chains  
 (B) phospholipids with short, unsaturated fatty acyl chains  
 (C) lower temperatures  
 (D) cholesterol at the usual concentrations found in biomembranes  
 (E) lipid rafts
20. A 400-bp covalently closed circular DNA with a linking number of 35 has 5 negative supercoils. When the linking number of this DNA is changed to 38 by a topoisomerase, this DNA will have  
 (A) 3 positive supercoils. (B) 3 negative supercoils. (C) 2 positive supercoil.  
 (D) 2 negative supercoils. (E) relaxed.
21. When a cell releases a signal molecule into the environment and a number of cells in the immediate vicinity respond, this type of signaling is  
 (A) typical of hormones. (B) autocrine signaling. (C) paracrine signaling. (D) endocrine signaling.  
 (E) synaptic signaling.
22. Which structure is **NOT** part of the endomembrane system?  
 (A) nuclear envelope (B) chloroplast (C) Golgi apparatus (D) plasma membrane (E) ER
23. What is a genome?  
 (A) An ordered display of chromosomes arranged from largest to smallest.  
 (B) A specific set of polypeptides within each cell.  
 (C) A specialized polymer of four different kinds of monomers.  
 (D) A specific segment of DNA that is found within a prokaryotic chromosome.  
 (E) The complete complement of an organism's genes.
24. Why are cattle able to survive on a diet consisting almost entirely of plant material?  
 (A) They are autotrophic.  
 (B) Cattle, like the rabbit, reingest their feces.  
 (C) They manufacture all 15 amino acids out of sugars in the liver.  
 (D) Cattle saliva has enzymes capable of digesting cellulose.  
 (E) They have cellulose-digesting, symbiotic microorganisms in chambers of their stomachs.



25. Which one of the following, if present in a urine sample, would likely be caused by trauma?  
 (A) amino acids            (B) glucose            (C) salts            (D) erythrocytes            (E) vitamins
26. The main source of energy for producers in an ecosystem is  
 (A) light energy.            (B) kinetic energy.            (C) thermal energy.            (D) chemical energy.            (E) ATP.
27. Trace elements are those required by organisms in only minute quantities. Which of the following is a trace element that is required by humans and other vertebrates?  
 (A) nitrogen            (B) calcium            (C) iodine            (D) sodium            (E) phosphorus
28. Which of the following pieces of evidence most strongly supports the common origin of all life on Earth?  
 (A) All organisms require energy.            (B) All organisms show heritable variation.  
 (C) All organisms reproduce.            (D) All organisms use essentially the same genetic code.  
 (E) All organisms have undergone evolution.
29. Which of these is the smallest unit upon which natural selection directly acts?  
 (A) a species' gene frequency            (B) a population's gene frequency  
 (C) an individual's genome            (D) an individual's genotype  
 (E) an individual's phenotype
30. The higher the proportion of loci that are "fixed" in a population, the lower is that population's  
 (A) nucleotide variability.            (B) genetic polyploidy.            (C) average heterozygosity.  
 (D) A, B, and C            (E) A and C only
31. Which of these should decline in hybrid zones where reinforcement is occurring?  
 (A) gene flow between distinct gene pools            (B) speciation  
 (C) the genetic distinctness of two gene pools            (D) mutation rate  
 (E) hybrid sterility
32. The largest unit within which gene flow can readily occur is a  
 (A) population.            (B) species.            (C) genus.            (D) hybrid.            (E) phylum.
33. Which statement represents the best explanation for the observation that the nuclear DNA of wolves and domestic dogs has a very high degree of homology?  
 (A) Dogs and wolves have very similar morphologies.  
 (B) Dogs and wolves belong to the same order.  
 (C) Dogs and wolves are both members of the order Carnivora.  
 (D) Dogs and wolves shared a common ancestor very recently.  
 (E) Convergent evolution has occurred.
34. Which of these statements about prokaryotes is correct?  
 (A) Bacterial cells conjugate to mutually exchange genetic material.  
 (B) Their genetic material is confined within a nuclear envelope.  
 (C) They divide by binary fission, without mitosis or meiosis.  
 (D) The persistence of bacteria throughout evolutionary time is due to their genetic homogeneity (i.e., sameness).  
 (E) Genetic variation in bacteria is not known to occur, nor should it occur, because of their asexual mode of reproduction.
35. If all prokaryotes on Earth suddenly vanished, which of the following would be the most likely and most direct result?  
 (A) The number of organisms on Earth would decrease by 10—20%.  
 (B) Human populations would thrive in the absence of disease.  
 (C) Bacteriophage numbers would dramatically increase.  
 (D) The recycling of nutrients would be greatly reduced, at least initially.  
 (E) There would be no more pathogens on Earth.
36. Which of the following is an ongoing trend in the evolution of land plants?  
 (A) decrease in the size of the leaf            (B) reduction of the gametophyte phase of the life cycle  
 (C) elimination of sperm cells or sperm nuclei            (D) increasing reliance on water to bring sperm and egg together  
 (E) replacement of roots by rhizoids
37. Cephalization is primarily associated with  
 (A) adaptation to dark environments.            (B) method of reproduction.            (C) fate of the blastopore.  
 (D) type of digestive system.            (E) bilateral symmetry.
38. The distinction between sponges and other animal phyla is based mainly on the absence versus the presence of  
 (A) a body cavity.            (B) a complete digestive tract.            (C) a circulatory system.  
 (D) true tissues.            (E) mesoderm.
39. What would be the most effective method of reducing the incidence of blood flukes in a human population?  
 (A) Reduce the mosquito population.            (B) Reduce the freshwater snail population.  
 (C) Purify all drinking water.            (D) Avoid contact with rodent droppings.  
 (E) Carefully wash all raw fruits and vegetables.

40. Which of these is **NOT** considered an amniote?  
 (A) amphibians (B) nonbird reptiles (C) birds (D) egg-laying mammals (E) placental mammals
41. Which of the following is true in plants?  
 (A) Mitosis occurs in gametophytes to produce gametes. (B) Meiosis occurs in sporophytes to produce spores.  
 (C) The gametophyte is within the flower in angiosperms. (D) A and B only (E) A, B, and C
42. We tend to think of plants as immobile when, in fact, they can move in many ways. All of the following are movements plants can accomplish **EXCEPT**  
 (A) growth movements up or down in response to gravity.  
 (B) folding and unfolding of leaves using muscle-like tissues.  
 (C) growth movements toward or away from light.  
 (D) changes in plant growth form in response to wind or touch.  
 (E) rapid responses using action potentials similar to those found in the nervous tissue of animals.
43. Which of the following is **NOT** true about estuaries?  
 (A) Estuaries are often bordered by mudflats and salt marshes.  
 (B) Estuaries contain waters of varying salinity.  
 (C) Estuaries support a variety of animal life that humans consume.  
 (D) Estuaries usually contain no or few producers.  
 (E) Estuaries support many semiaquatic species.
44. Carrying capacity is  
 (A) seldom reached by marine producers and consumers because of the vast resources of the ocean.  
 (B) the maximum population size that a particular environment can support.  
 (C) fixed for most species over most of their range most of the time.  
 (D) determined by density and dispersion data.  
 (E) the term used to describe the stress a population undergoes due to limited resources.
45. The emergence of 14 species of Galápagos finches from a common ancestor that finds itself in a new environment is called  
 (A) adaptive radiation. (B) jumping selection. (C) disruptive selection. (D) sympatric speciation. (E) hybridization.
46. The life history strategy of an *k*-selected species is to  
 (A) take advantage of human activity, such as clearing woodlots.  
 (B) allocate energy to their own survival and to the survival of their descendants.  
 (C) produce thousands of eggs.  
 (D) become prey.  
 (E) reproduce at early age.
47. Which of the following mechanisms is essential for animal navigation?  
 (A) a time keeping mechanism (B) a color recognition mechanism  
 (C) a scent recognition mechanism (D) a sound discrimination mechanism  
 (E) a touch discrimination mechanism
48. The sexually mature organism retains traits of the juvenile stage of the organism's ancestor. This is called \_\_\_\_\_.  
 (A) metamorphosis (B) pseudomorphosis (C) pedomorphosis (D) premorphosis (E) adultery
49. Which of the following statements regarding balancing selection is **FALSE**?  
 (A) The balancing selection maintains genetic diversity in a population.  
 (B) The balancing selection can create a balanced polymorphism.  
 (C) Homozygote advantage is usually favored by the balancing selection.  
 (D) The balancing selection is a type of natural selection which does not always cause the elimination of weaker alleles.  
 (E) The balancing selection can occur through negative frequency-dependent selection.
50. Isolated populations will lose a percentage of their original diversity over time, approximately at the rate of  $1/(2N)$  per generation, where  $N$  = population size. After 20 generations, the original population of 500 will lose \_\_\_ of its original genetic variation.  
 (A) 20% (B) 2% (C) 4% (D) 8% (E) 16%.

II. 【單選題】 51-75 題，每題 2 分，共計 50 分。答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

51. Which of the following statements about umbrella species is correct?  
 (A) Umbrella species are species whose habitat requirements are critical to a certain small area.  
 (B) The Northern spotted owl (*Strix occidentalis*) is considered to be an important umbrella species.  
 (C) The gopher tortoises (*Gopherus polyphemus*) is considered to be an important umbrella species.  
 (D) Umbrella species must be attractive and more readily engendered support from the public for their conservation.  
 (E) Formosan macaques are considered to be an important umbrella species in Taiwan.

52. In present populations of Taiwan Hwa-Mei (*Leucodioptron taewanum*) in Taiwan, genetic diversity has been  
 (A) lost through mutation and restored by natural selection.  
 (B) lost through stabilizing selection and restored by balancing selection.  
 (C) lost through directional selection and restored by balancing selection.  
 (D) lost through hybridization and restored by natural selection.  
 (E) lost through artificial selection and restored by natural selection.
53. The Morakot typhoon inflicted catastrophic damages on rivers and wiped out entire population of fishes in the river. This is an example of  
 (A) a density-dependent effect. (B) the effects of abiotic factors.  
 (C) the interaction between density-dependent and abiotic factors. (D) founder effect.  
 (E) dispersal effect.
54. Which of the following mating systems does the Pheasant-tailed Jacana (*Hydrophasianus chirurgus*) exhibit in paddy fields in Tainan?  
 (A) monogamy (B) polyandry (C) polygyny (D) promiscuity (E) none of the above
55. When Thomas Hunt Morgan crossed his red-eyed F1 generation flies to each other, the F2 generation included both red- and white-eyed flies. Remarkably, all the white-eyed flies were male. What was the explanation for this result?  
 (A) The gene involved is on the X chromosome. (B) The gene involved is on the Y chromosome.  
 (C) The gene involved is on an autosome. (D) Other male-specific factors influence eye color in flies.  
 (E) Other female-specific factors influence eye color in flies.
56. Sequencing an entire genome, such as that of *Caenorhabditis elegans*, a nematode, is most important because  
 (A) it allows researchers to use the sequence to build a "better" nematode, resistant to disease.  
 (B) it allows research on a group of organisms we do not usually care much about.  
 (C) the nematode is a good animal model for trying out cures for viral illness.  
 (D) a sequence that is found to have a particular function in the nematode is likely to have a closely related function in vertebrates.  
 (E) a sequence that is found to have no introns in the nematode genome is likely to have acquired the introns from higher organisms.
57. Countercurrent exchange in the fish gill helps to maximize which of the following?  
 (A) endocytosis (B) blood pressure (C) diffusion (D) active transport (E) osmosis
58. Sexual reproduction  
 (A) allows animals to conserve resources and reproduce only during optimal conditions.  
 (B) can produce diverse phenotypes that may enhance survival of a population in a changing environment.  
 (C) yields more numerous offspring more rapidly than is possible with asexual reproduction.  
 (D) enables males and females to remain isolated from each other while rapidly colonizing habitats.  
 (E) guarantees that both parents will provide care for each offspring.
59. Members of two different species possess a similar-looking structure that they use in a similar fashion to perform the same function. Which information would best help distinguish between an explanation based on homology versus one based on convergent evolution?  
 A) The two species live at great distance from each other.  
 B) The two species share many proteins in common, and the nucleotide sequences that code for these proteins are almost identical.  
 C) The sizes of the structures in adult members of both species are similar in size.  
 D) Both species are well adapted to their particular environments.  
 E) Both species reproduce sexually.
60. The recessive allele that causes phenylketonuria (PKU) is harmful, except when an infant's diet lacks the amino acid, phenylalanine. What maintains the presence of this harmful allele in a population's gene pool?  
 (A) heterozygote advantage (B) stabilizing selection (C) diploidy  
 (D) balancing selection (E) kin selection
61. Bagworm moth caterpillars feed on evergreens and carry a silken case or bag around with them in which they eventually pupate. Adult female bagworm moths are larval in appearance; they lack the wings and other structures of the adult male and instead retain the appearance of a caterpillar even though they are sexually mature and can lay eggs within the bag. This is a good example of  
 (A) allometric growth. (B) paedomorphosis. (C) sympatric speciation. (D) adaptive radiation.  
 (E) changes in homeotic genes.
62. Hypothetical mutation in a squirrel population produces organisms with eight legs rather than four. Further, these mutant squirrels survive, successfully invade new habitats, and eventually give rise to a new species. The initial event, giving rise to extra legs, would be a good example of  
 (A) punctuated equilibrium. (B) species selection. (C) habitat selection.  
 (D) changes in homeotic genes. (E) allometry.

63. Species that are not closely related and that do not share many anatomical similarities can still be placed together on the same phylogenetic tree by comparing their  
 (A) plasmids. (B) chloroplast genomes. (C) mitochondrial genomes.  
 (D) homologous genes that are poorly conserved. (E) homologous genes that are highly conserved.
64. Animal communication involves what type of sensory information?  
 A) visual B) auditory C) chemical D) A and C only E) A, B, and C
65. Which of the following statements about histone acetylation is **WRONG**?  
 (A) Histone acetylation usually occurs within the tail region.  
 (B) Histone acetylation decreases the positive charge of histones.  
 (C) Histone acetylation reduces the histone-DNA affinity.  
 (D) Histone acetylation promotes the 30-nm fiber formation.  
 (E) Histone acetylation is usually associated with activation of gene expression.
66. Which of the following statements is true?  
 (A) miRNAs are made from long dsRNAs, whereas siRNAs are made from large hairpin precursors.  
 (B) miRNAs are made from large hairpin precursors, whereas siRNAs are made from long dsRNAs.  
 (C) Both miRNAs and siRNAs are made from long dsRNAs.  
 (D) Both miRNAs and siRNAs are made from large hairpin precursors.  
 (E) none of the above
67. Attaching the activation domain of Gal4 to the Tet (tetracycline) repressor creates a hybrid protein that will  
 (A) bind to the Gal4 binding site in response to galactose. (B) bind to the Gal4 binding site in response to tetracycline.  
 (C) bind to the *tet* operator in response to tetracycline. (D) bind to the *tet* operator in response to galactose.  
 (E) all of the above
68. In a neuron at rest, which of the following is true?  
 (A) Leakage of sodium ions into the neuron is greater than leakage of potassium ions out of the neuron.  
 (B) Leakage of sodium ions out of the neuron is greater than leakage of potassium ions into the neuron.  
 (C) Leakage of potassium ions into the neuron is greater than leakage of sodium ions out of the neuron.  
 (D) Leakage of potassium ions out of the neuron is greater than leakage of sodium ions into the neuron.  
 (E) Leakage of potassium ions out of the neuron is equivalent to leakage of sodium ions into the neuron.
69. Which is **NOT** involved in RNA editing?  
 (A) site-specific deamination of adenines (B) site-specific deamination of cytosines  
 (C) guide RNA-directed uridine insertion (D) guide RNA-directed uridine deletion  
 (E) snoRNA-directed 2'-OH methylation
70. The effect of 5-Azacytosine on gene expression is to  
 (A) prevent chromatin remodeling. (B) prevent RNA editing. (C) remove DNA methylation.  
 (D) enhance DNA recombination. (E) remove histone acetylation.
71. Influenza virus has pH-sensitive, acidic fusogenic proteins. Based on this, influenza virus would be expected to fuse with  
 (A) plasma membrane. (B) membrane of trans-Golgi network. (C) membrane of late endosomes.  
 (D) membrane of mitochondria. (E) membrane of peroxisomes.
72. Which of the following statements best compares a pseudocoelom and a coelom?  
 (A) A pseudocoelom is completely enclosed by mesoderm whereas a coelom has an outer covering of mesoderm and an inner one of endoderm.  
 (B) A coelom is completely enclosed by mesoderm whereas a pseudocoelom has an outer covering of mesoderm and an inner one of endoderm.  
 (C) The coelom is enclosed by ectoderm and the pseudocoelom is enclosed by endoderm.  
 (D) The pseudocoelom is enclosed by ectoderm and the coelom is enclosed by endoderm.  
 (E) The coelom is enclosed by ectoderm and the pseudocoelom is enclosed by mesoderm.
73. A partial diploid *E. coli* with which of the following genotypes would turn blue on the plate containing X-Gal in the presence or absence of the inducer IPTG?  
 (A)  $I^+O^+lacZ^+ / I^+O^+lacZ^-$  (B)  $I^+O^+lacZ^+ / I^+O^+lacZ^-$  (C)  $I^+O^c lacZ^- / I^+O^+lacZ^+$   
 (D)  $I^+O^c lacZ^+ / I^+O^+lacZ^+$  (E)  $I^+O^c lacZ^- / I^+O^+lacZ^+$
74. A mutant cell does not have mannose 6-phosphate receptor. Lysosomal enzymes in this cell will  
 (A) not be synthesized. (B) be in the cytosol. (C) be in the ER.  
 (D) be secreted. (E) be in the lysosome.
75. Place the following events of mitosis in the correct order.  
 I. Sister chromatids align on the metaphase plate. II. The cleavage furrow forms.  
 III. The nuclear membrane breaks up. IV. Sister chromatids condense.  
 V. Sister chromatids separate.  
 (A) I, II, III, IV, V (B) III, IV, I, V, II (C) IV, III, I, V, II (D) III, II, I, IV, V (E) IV, I, III, V, II

高雄醫學大學 100 學年度學士後醫學系招生考試試題

科目:有機化學

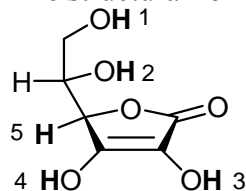
考試時間: 80 分鐘

說明:一、選擇題用 2B 鉛筆在「答案卡」上作答,修正時應以橡皮擦擦拭,不得使用修正液(帶),未遵照正確作答方法而致電腦無法判讀者,考生自行負責。  
二、試題及答案卡必須繳回,不得攜出試場。

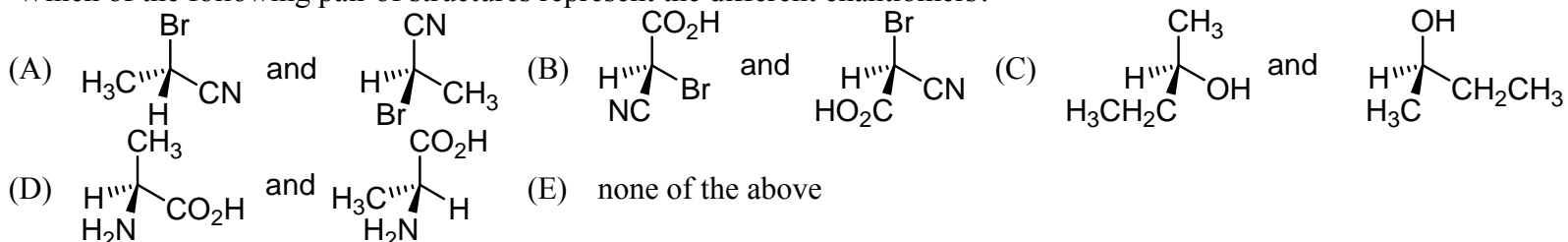
I. Choose one correct answer for the following questions

【單選題】每題 1 分,共計 60 分,答錯 1 題倒扣 0.25 分,倒扣至本大題零分為止,未作答,不給分亦不扣分。

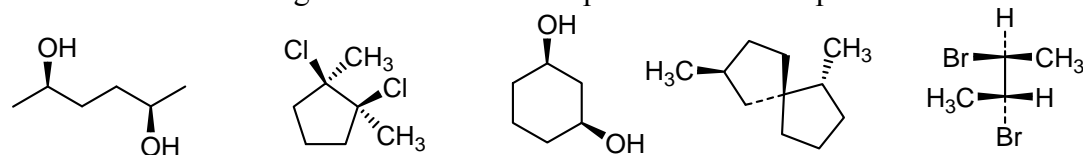
- Which of the following amines gives the **correct** order of base strengths?  
(A) aliphatic > ammonia > aromatic (B) aliphatic > aromatic > ammonia (C) aromatic > aliphatic > ammonia  
(D) aromatic > ammonia > aliphatic (E) ammonia > aromatic > aliphatic
- The structural formula for vitamin C is shown below, identified by **H** which is most acidic?



- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
- What term describes the structural relationship between (2*R*,3*R*,4*S*)-2,3,4-trichloroheptane and (2*R*,3*R*,4*R*)-2,3,4-trichloroheptane?  
(A) not isomers (B) constitutional isomers (C) enantiomers  
(D) diastereomers (E) conformers
  - Rank the following sets of substituents in order of Cahn-Ingold-Prelog priorities from highest to lowest. Please pick the **wrong** order set.  
(A) -Cl, -S, -P, -H (B) -Br, -OH, -CH<sub>3</sub>, -H (C) -CO<sub>2</sub>H, CH<sub>2</sub>OH, -CH<sub>2</sub>NH<sub>2</sub>, -CN  
(D) -CH<sub>2</sub>OH, -CH=CH<sub>2</sub>, -CH<sub>2</sub>CH<sub>3</sub>, -CH<sub>3</sub> (E) -CH<sub>2</sub>OCH<sub>3</sub>, -CN, -C≡CH, -CH<sub>2</sub>CH<sub>3</sub>
  - Which of the following pair of structures represent the different enantiomers?

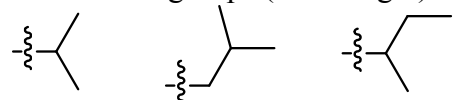


- Which of the following structure **does not** represent **meso** compounds?



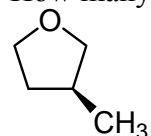
- (A) I (B) II (C) III (D) IV (E) V

- Which of the statements below correctly describes an achiral molecule?  
(A) the molecule has a nonsuperimposable mirror image  
(B) the molecule exhibits optical activity when it interacts with plane-polarized light  
(C) the molecule has an enantiomer (D) the molecule might be a meso form (E) none of the above
- Name these groups (left to right)



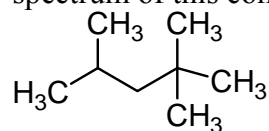
- (A) *sec*-propyl, *sec*-butyl, isobutyl (B) isopropyl, isobutyl, *sec*-butyl (C) *sec*-propyl, *tert*-butyl, isobutyl  
(D) isopropyl, *tert*-butyl, isobutyl (E) isopropyl, *tert*-butyl, *sec*-butyl

- What compound is formed when 2,2-dimethyloxirane is treated with ethanol containing a trace of HCl?  
(A) 2-ethoxy-2-methyl-1-propanol (B) 1-ethoxy-2-methyl-2-propanol (C) 2-ethoxy-2-methyl-2-propanol  
(D) 2-ethoxy-1-butanol (E) 1-ethoxy-2-butanol
- Which of the following compounds gives a <sup>1</sup>H-NMR spectrum consisting of only two singlets?  
(A) CH<sub>3</sub>OCH<sub>2</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>3</sub> (B) CH<sub>3</sub>OCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>OH (C) CH<sub>3</sub>OC(CH<sub>3</sub>)<sub>2</sub>OCH<sub>3</sub>  
(D) CH<sub>3</sub>OCH<sub>2</sub>CH(CH<sub>3</sub>)OCH<sub>3</sub> (E) CH<sub>3</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>3</sub>
- How many peaks appear in the proton spin decoupled <sup>13</sup>C-NMR spectrum of the compound below?



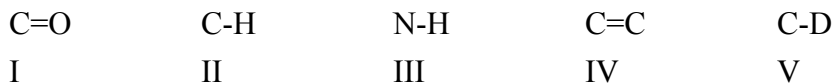
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

12. Consider the branched hydrocarbon to the right. Which of the following would **not** be a prominent peak in the mass spectrum of this compound?



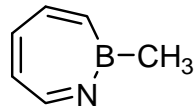
- (A)  $m/z = 43$  (B)  $m/z = 57$  (C)  $m/z = 99$  (D)  $m/z = 113$  (E)  $m/z = 43$  and  $m/z = 99$

13. The correct order of **increasing** IR stretching frequencies for the following bonds.

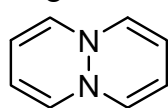


- (A) IV, I, V, II, III (B) IV, III, I, V, II (C) I, IV, II, V, III (D) IV, I, II, III, V (E) I, IV, III, II, V

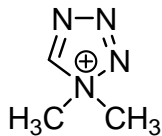
14. Which of the following molecules is aromatic?



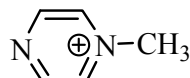
1



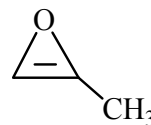
2



3



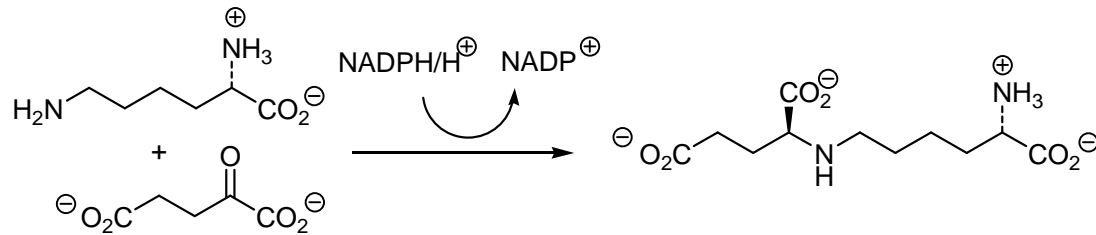
4



5

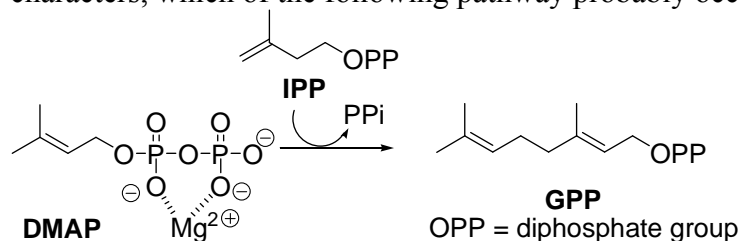
- (A) 2 (B) 2 and 5 (C) 3 and 4 (D) 4 (E) 1 and 4

15. The following reaction presents the first step in the biological degradation of lysine. Please indicate the role of NADPH and name this reaction.



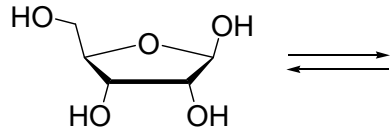
- (A) reducing agent, reductive amination (B) reducing agent, decarboxylation  
 (C) hydrogenation agent, Lindlar's reaction (D) oxidized agent, transamination  
 (E) oxidized agent, aldol condensation

16. The exact mechanism of the following reaction is difficult to establish conclusively. However, based on substrate characters, which of the following pathway probably occurs to give GPP?



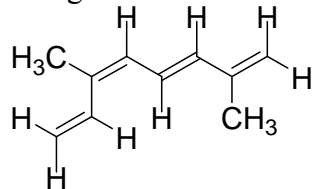
- (A)  $S_N1$ -like (B)  $E2$ -like (C)  $E1cB$ -like (D)  $E1$ -like (E) none of the above

17. Which is the **correct** structure for the equilibrium below?



- (A)  $\begin{array}{c} \text{CHO} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$  (B)  $\begin{array}{c} \text{CHO} \\ || \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$  (C)  $\begin{array}{c} \text{CHO} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$  (D)  $\begin{array}{c} \text{CHO} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{CH}_2\text{OH} \end{array}$  (E)  $\begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$

18. Assign *E/Z* nomenclature to the following alkene.

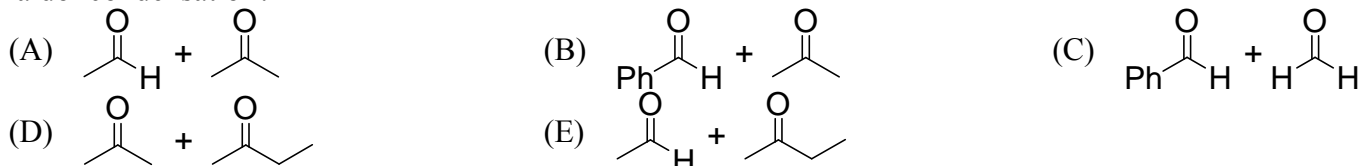


- (A) (1Z, 3Z, 5Z, 7Z) (B) (1E, 3E, 5Z, 7Z) (C) (1E, 3E, 5E, 7Z) (D) (3E, 5Z) (E) (3Z, 5Z)

19. Which of the following is least likely to undergo a smooth crossed Claisen condensation with methyl pentanoate?

- (A)  $(\text{CH}_3)_3\text{CCO}_2\text{CH}_3$  (B)  $\text{PhCH}_2\text{CO}_2\text{CH}_3$  (C)  $\text{PhCO}_2\text{CH}_3$  (D)  $\text{HCO}_2\text{CH}_3$  (E)  $(\text{CH}_3\text{O})_2\text{CO}$

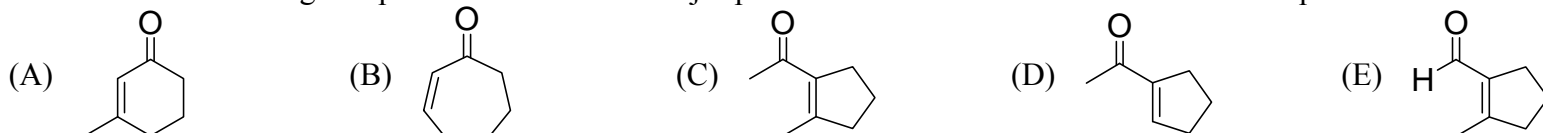
20. Which of the following pairs of compounds would be the **most** reasonable choice for an attempt at a "mixed" or "crossed" aldol condensation?



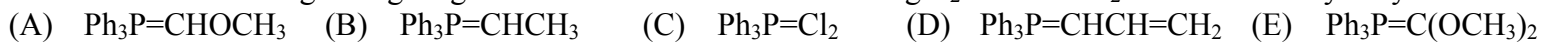
21. Which is the only one of these compounds which **cannot** self-condense in the presence of dilute aqueous alkali?

- (A) phenylethanal (B) propanal (C) 2,2-dimethylpropanal (D) 2-methylpropanal (E) 3-methylpentanal

22. Which of the following compounds would be the major product from aldol condensation of 6-oxoheptanal?



23. Which of the following Wittig reagents would be useful for converting  $R_2C=O$  into  $R_2CHCHO$  after hydrolysis?



24. Reaction of ethylmagnesium bromide with which of the following compounds yields a tertiary alcohol after quenching with aqueous acid?

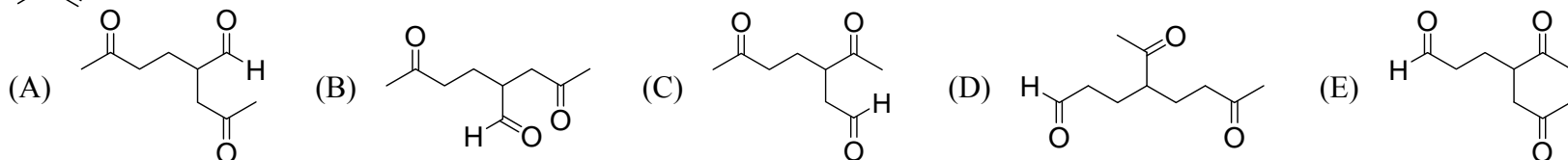
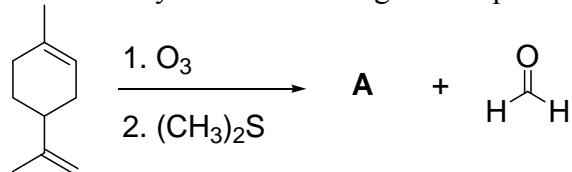


25. What starting materials would be suitable for preparing this compound by a combination of Michael and aldol reactions?

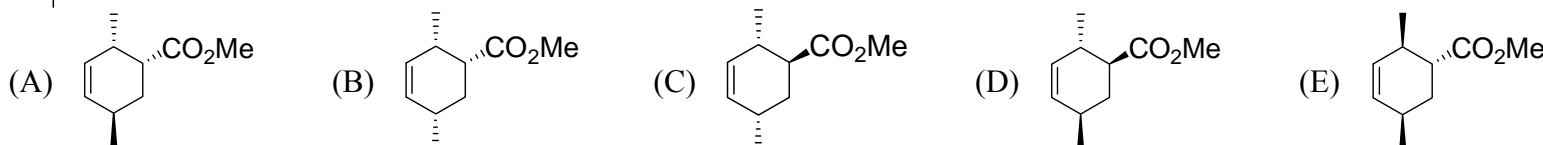
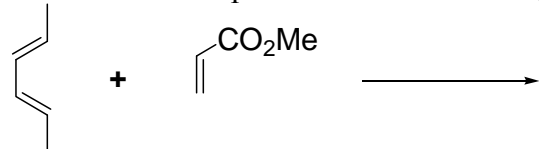


- (A) 4-methyl-2-cyclohexen-1-one and 3-butenal (B) 2-methylcyclohexane-1,3-dione and 3-buten-2-one  
 (C) 2-methyl-2-vinyl-3-cyclohexen-1-one and acetaldehyde (D) 2-methyl-2-cyclohexen-1-one and 1,4-dichlorobutan-2-one  
 (E) 4-methylcyclohexanone and methyl vinyl ketone

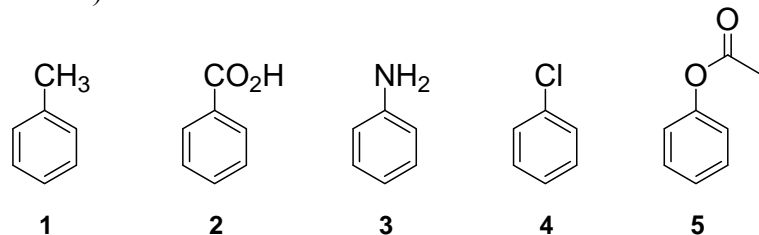
26. The ozonolysis of limonene give compound **A** plus formaldehyde. Choose the correct structure for **A**.



27. Choose the endo product for the following reaction:



28. Rank the following compounds in order of increasing reactivity towards chlorination with  $Cl_2/AlCl_3$  (slowest reacting to fastest).



- (A)  $3 < 4 < 2 < 1 < 5$  (B)  $2 < 4 < 1 < 3 < 5$  (C)  $4 < 2 < 1 < 3 < 5$  (D)  $2 < 4 < 5 < 1 < 3$  (E)  $2 < 4 < 1 < 5 < 3$

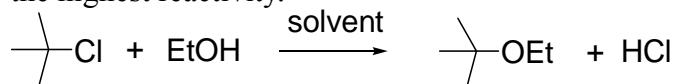
29. What compound is produced when (*R*)-pentan-2-ol is treated with  $TsCl$  followed by  $NaI$ ?

- (A) sodium (*R*)-pent-3-oxide (B) sodium (*S*)-pent-2-oxide (C) (*R*)-2-iodopentane  
 (D) (*S*)-2-iodopentane (E) none of the above

30. What type of intermediate is present in the  $S_N2$  reaction of cyanide with bromoethane?

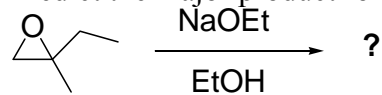
- (A) carbocation (B) free radical (C) carbene  
 (D) carbanion (E) This reaction has no intermediate

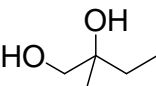
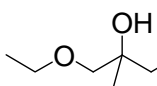
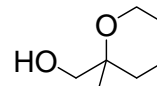

31. The reaction reactivity was studied in different solvent. Please indicate the **best** solvent for the following reaction to offer the highest reactivity.



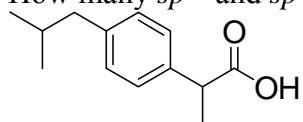
- (A) hexane (B) chloroform (C) ethanol (D) water (E) no difference

32. Predict the major product for the following reaction.



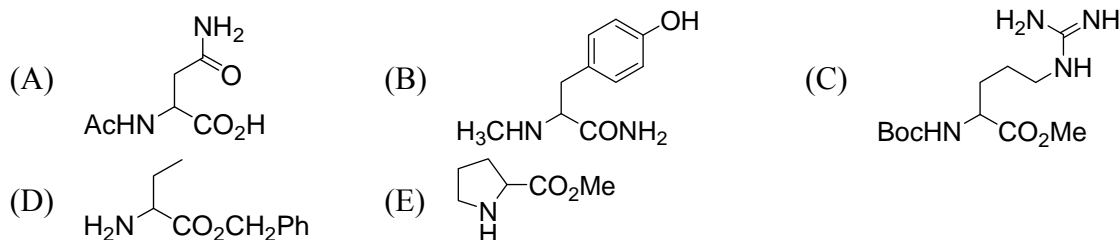
- (A)  (B)  (C)  (D)  (E) none of the above

33. How many  $sp^3$ - and  $sp^2$ -hybridized carbons does the following compound have?



- (A) 6 and 7 (B) 7 and 6 (C) 8 and 4 (D) 4 and 8 (E) none

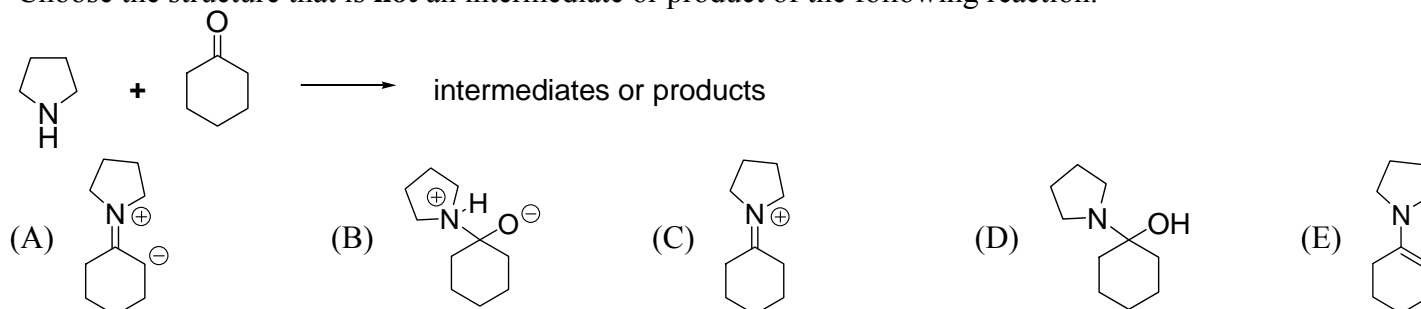
34. Ninhydrin can rapidly react with a certain type of functional group to produce an intense purple color (positive result). Which of the following compounds can get a positive result after a ninhydrin test?



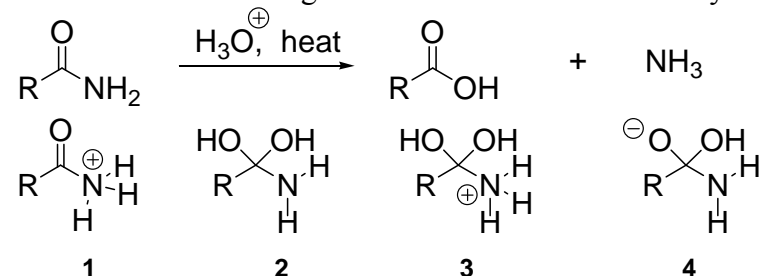
35. When 2-methylcyclohexanone is treated with catalytic base in excess  $D_2O$ , how many deuterium atoms become incorporated in the organic compound?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 5

36. Choose the structure that is **not** an intermediate or product of the following reaction.



37. Which of the following are intermediates in the acid hydrolysis of an amide?

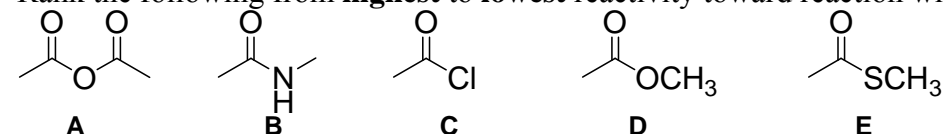


- (A) 4 (B) 1, 2 and 3 (C) 1 (D) 2 (E) 2 and 3

38.  $LiAl[OC(CH_3)_3]_3H$  will reduce an acid chloride to an:

- (A) alcohol (B) alkane (C) acid (D) aldehyde (E) acetal

39. Rank the following from **highest** to **lowest** reactivity toward reaction with EtOH.



- (A) A > C > E > D > B (B) C > A > E > D > B (C) E > C > A > D > B  
(D) C > A > B > E > D (E) C > A > D > B > E

40. In the mechanism for the dehydrohalogenation of 3-chloro-3,7-dimethyloctane, what is the dihedral angle between the hydrogen and chlorine atoms that are eliminated?

- (A) 0 degree (B) 45 degrees (C) 90 degrees (D) 135 degrees (E) 180 degrees

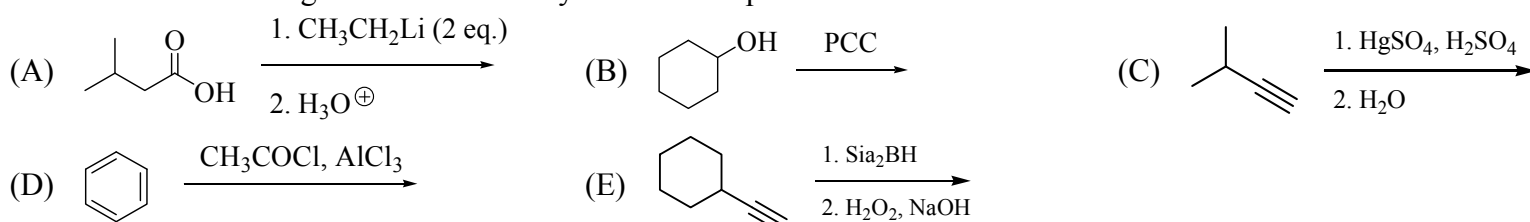
41. Which reagent is used to accelerate coupling reactions in both laboratory peptide synthesis and laboratory DNA synthesis?

- (A) catalytic  $H^+$  (B) dicyclohexylcarbodiimide (C) sodium hydroxide (D) ethyl chloroformate (E)  $PhS^{\ominus}NH_4^{\oplus}$

42. What reagent is used to convert pentanamide to 1-pentanamine?

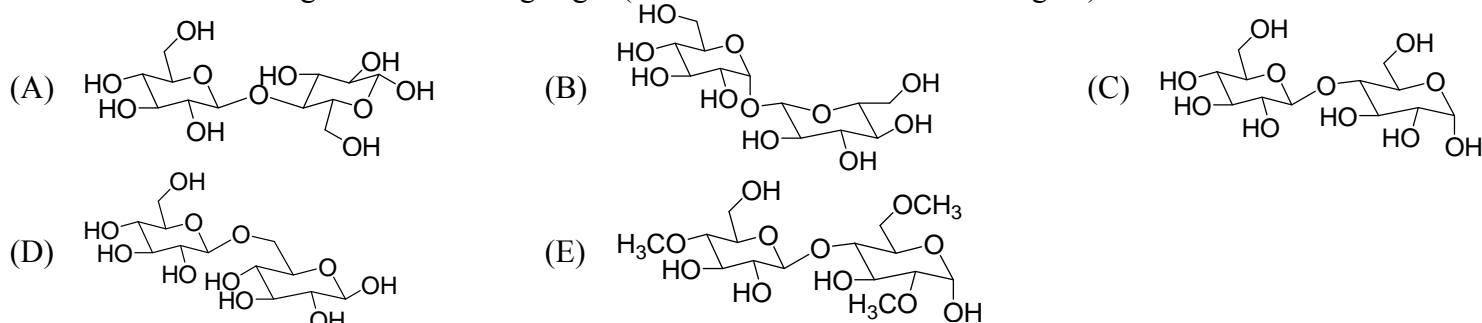
- (A)  $POCl_3$  (B)  $CuCN$  (C)  $MeMgBr$  (D)  $SOCl_2$  (E)  $LiAlH_4$

43. Which of the following reactions will **not** yield a ketone product?

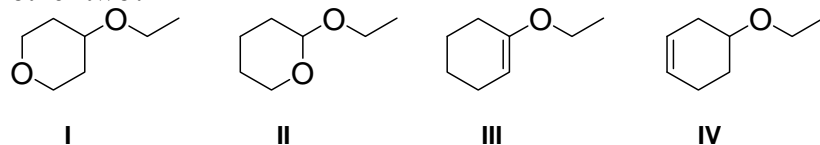




44. Which of the following is a nonreducing sugar (does **not** react with Tollens' reagent)?

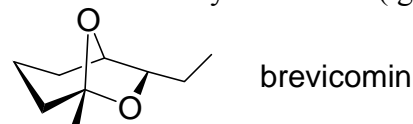


45. Formulas for four ethyl ethers are drawn below. Which two ethers are cleaved by aqueous acid much more easily than the other two?



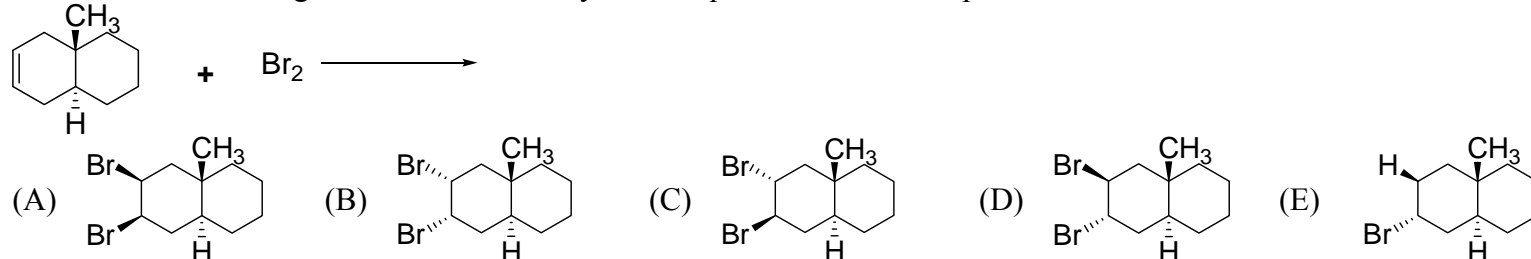
(A) I and II (B) II and III (C) III and IV (D) I and IV (E) III and IV

46. The formula of brevicomin, a pheromone of the western pine beetle, is shown below. What open chain ketodiols would close to this bicyclic acetal? (ignore stereoisomer issues)



(A) 7,8-dihydroxynonan-3-one (B) 6,7-dihydroxynonan-3-one (C) 7,8-dihydroxynonan-2-one  
 (D) 6,7-dihydroxynonan-2-one (E) 6,7-dihydroxynonan-4-one

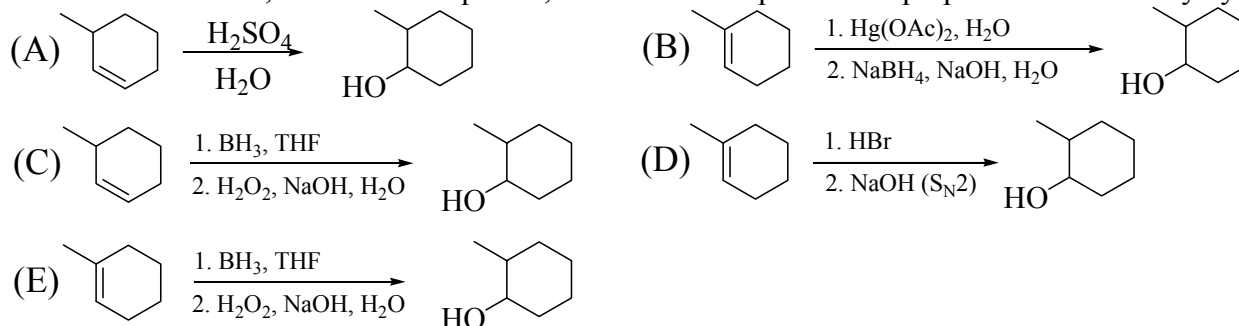
47. Which of the following will be the kinetically favored product from the depicted reaction?



48. Which of the following alcohols undergoes dehydration upon heating with concentrated H<sub>2</sub>SO<sub>4</sub> **without** carbocation rearrangement?

(A) 2-methylhexan-3-ol (B) 3-methylpentan-3-ol (C) 3,3-dimethylpentan-2-ol  
 (D) 2-methyl-2-phenylpropan-1-ol (E) both A and B

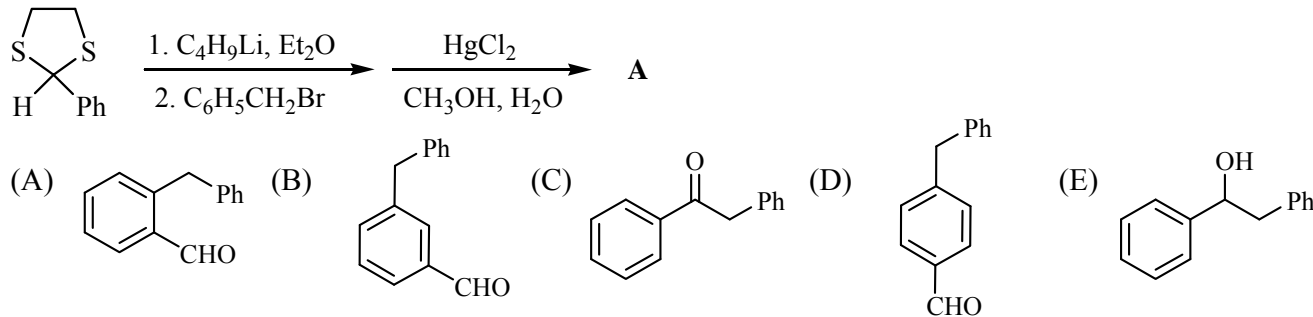
49. Choose the reaction, or reaction sequence, that best accomplishes the preparation of 2-methylcyclohexanol.



50. Alkoxymercuration followed by sodium borohydride reduction would be used to produce \_\_\_\_\_

(A) alcohol from an alkene (B) aldehyde from alcohol (C) acid from an alkyne  
 (D) ether from an alkene (E) alkene from an aryl halide

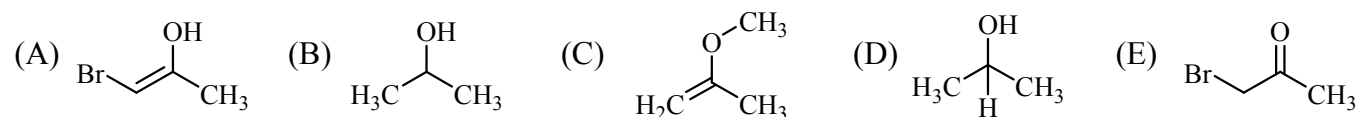
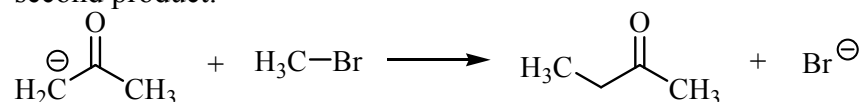
51. What is the structure for A?



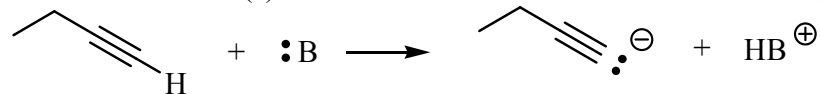
52. Which reagent(s) can be used to convert bromobenzene to benzoic acid?

(A) 1. NaCN; 2. NaOH, H<sub>2</sub>O (B) KMnO<sub>4</sub> (C) 1. Mg; 2. CO<sub>2</sub>, then H<sub>3</sub>O<sup>+</sup>  
 (D) CrO<sub>3</sub>, HCl (E) 1. CH<sub>3</sub>Br; 2. CrO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>.

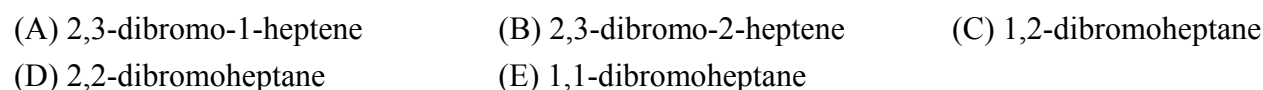
53. In addition to 2-butanone, a second product is formed in the following acid-base reaction. Choose the structure for this second product.



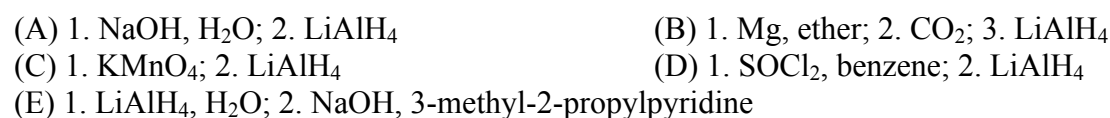
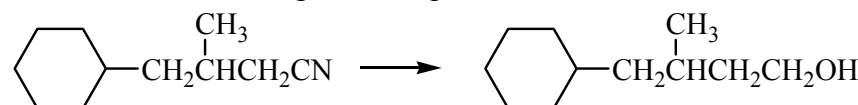
54. Which of the base(s) below that **cannot** be used in the following reaction.



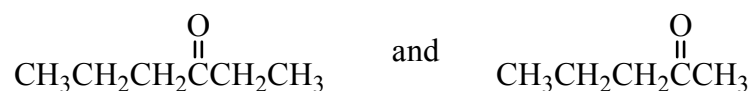
55. What is the major organic product that results when 1-heptyne is treated with 2 equivalents of HBr?



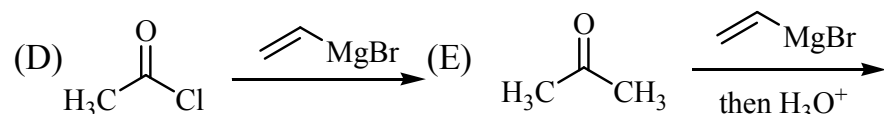
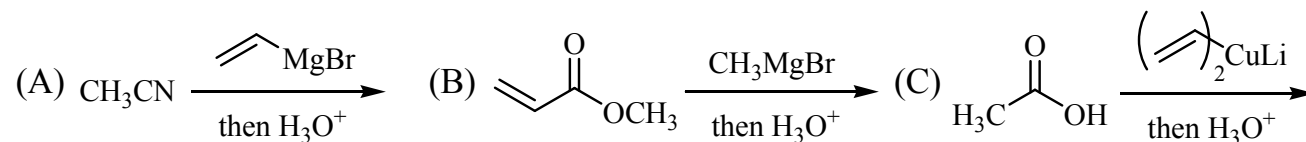
56. Which of the following would represent the **correct** reaction conditions for the following conversion?



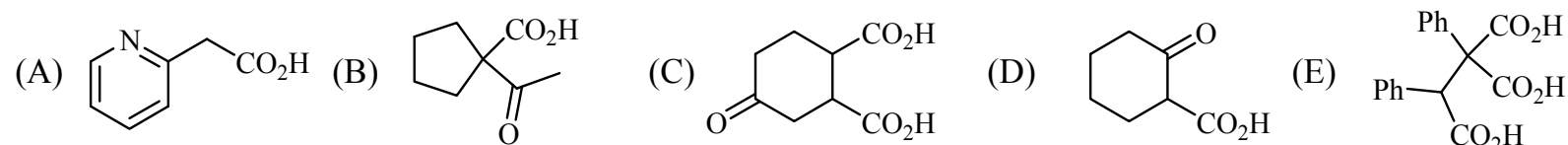
57. Which reagent would best serve as the basis for a simple chemical test to distinguish the two compounds below



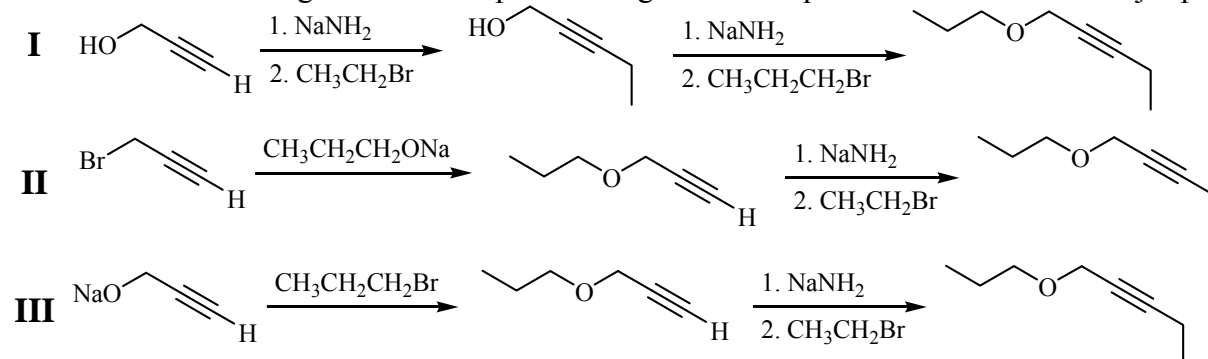
58. Which of the following is a suitable method for synthesizing **only** methyl vinyl ketone (CH<sub>3</sub>COCH=CH<sub>2</sub>)?



59. Which of the following acids does **not** decarboxylate on heating?

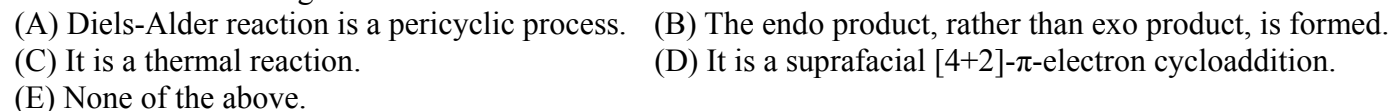


60. Which of the following schemes will proceed to give the compound indicated as the major product.



【單選題】每題 2 分，共計 40 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

61. Which of the following statement for Diels-Alder reaction is **false**?



62. Choose the **incorrect** statement about the following acid/base reactions involving propyne and its anion propynide. (pKa : H<sub>2</sub>O = 16; CH<sub>3</sub>C≡CH = 25; NH<sub>3</sub> = 34)
- (i)  $\text{CH}_3\text{C}\equiv\text{CH} + \text{OH}^\ominus \rightleftharpoons \text{CH}_3\text{C}\equiv\text{C}^\ominus + \text{H}_2\text{O}$   
(ii)  $\text{CH}_3\text{C}\equiv\text{CH} + \text{NH}_2^\ominus \rightleftharpoons \text{CH}_3\text{C}\equiv\text{C}^\ominus + \text{NH}_3$
- (A) The equilibrium in (i) lies to the left. (B) The equilibrium in (ii) lies to the right.  
(C) You can prepare propynide salts in NH<sub>3</sub> (D) In reaction (ii) ammonia, NH<sub>3</sub>, acts as a base.  
(E) Propyne is a stronger acid than ammonia

63. Which of the following compound does not contain carbonyl group(s) in its structure?

(A) dicyclohexylcarbodiimide (B) cycloheptatrienone (C) sulfanilamide  
(D) benzoyl phosphate (E) dimethyl malonate

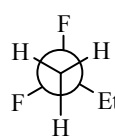
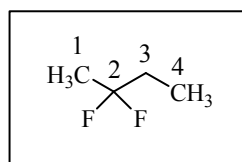
64. Which compound has the smallest heat of hydrogenation?

(A) 5-methyl-1,2-hexadiene (B) (*E*)-5-methyl-1,3-hexadiene (C) 5-methyl-1,4-hexadiene  
(D) 2-methyl-1,5-hexadiene (E) (*E*)-2-methyl-2,4-hexadiene

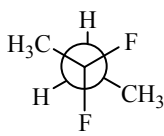
65. The correct priority of functional groups in IUPAC nomenclature is:

(A) acid > ester > amide > ketone (B) amide > acid > ester > ketone (C) amide > ester > acid > ketone  
(D) ester > amide > ketone > acid (E) ketone > acid > ester > amide

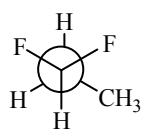
66. Structure I-IV may represent a conformation of 2,2-difluorobutane sighting along **any** C-C bond. Please pick up right structures.



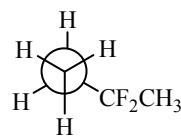
I



II



III



IV

(A) I, II, III (B) II, III, IV (C) I, II, IV (D) all of the above (E) none of the above

67. Which of the following reactions of alkenes is **not** stereospecific?

(A) bromohydrin formation (Br<sub>2</sub> in H<sub>2</sub>O) (B) hydrogenation (H<sub>2</sub>, Pd)  
(C) bromination (Br<sub>2</sub>) (D) acid-catalyzed hydration (H<sub>2</sub>O, H<sub>2</sub>SO<sub>4</sub>)  
(E) dihydroxylation (OsO<sub>4</sub>, NaHSO<sub>3</sub>)

68. Which system would give the **largest** ratio of substitution to elimination product(s)?

(A) cyclohexanol + acid (B) cyclohexyl iodide + *t*-BuOK in *t*-BuOH  
(C) 1-bromobutane + *t*-BuOK in DMSO (D) 1-bromobutane + KI in acetone  
(E) 2-bromobutane + MeONa in DMSO

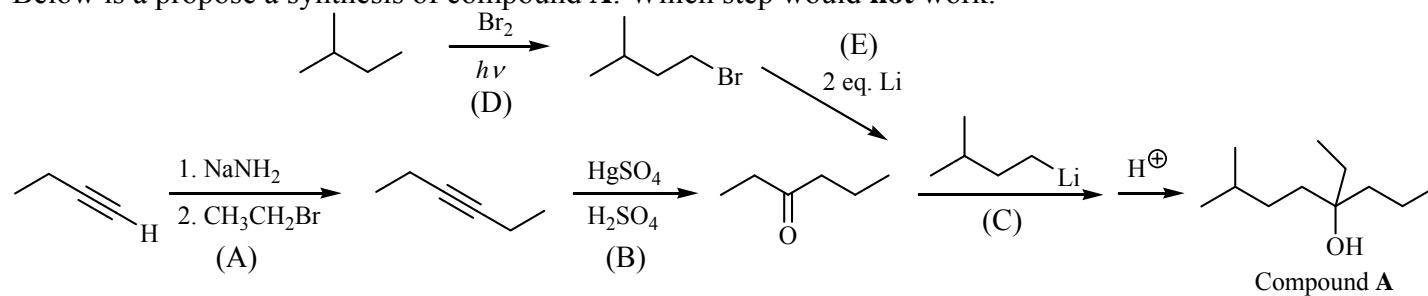
69. Optically pure (*S*)-monosodium glutamate has a specific rotation of +25°, what percent of (*R*)-monosodium glutamate in a sample with a specific rotation of -10°?

(A) 10% (B) 30% (C) 40% (D) 70% (E) 50%

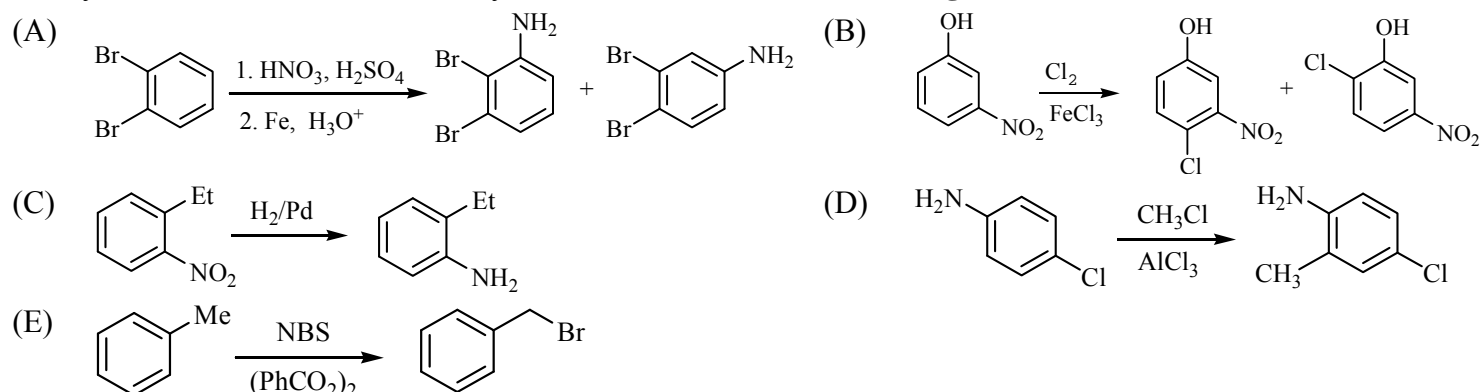
70. What reagents can be used to convert 1-hexyne into 2-hexanone?

(A) 1. Sia<sub>2</sub>BH; 2. H<sub>2</sub>O<sub>2</sub>, NaOH (B) Hg<sup>2+</sup>, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O (C) 1. O<sub>3</sub>; 2. (CH<sub>3</sub>)<sub>2</sub>S  
(D) 1. CH<sub>3</sub>MgBr; 2. CO<sub>2</sub> (E) 1. H<sub>2</sub>, Ni; 2. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, H<sub>2</sub>SO<sub>4</sub>

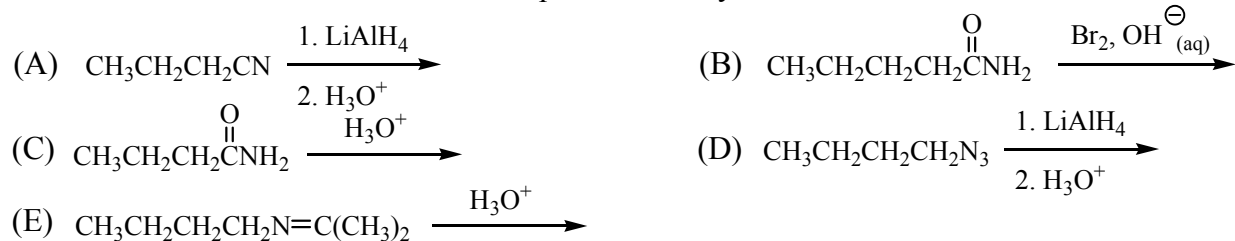
71. Below is a propose a synthesis of compound **A**. Which step would **not** work.



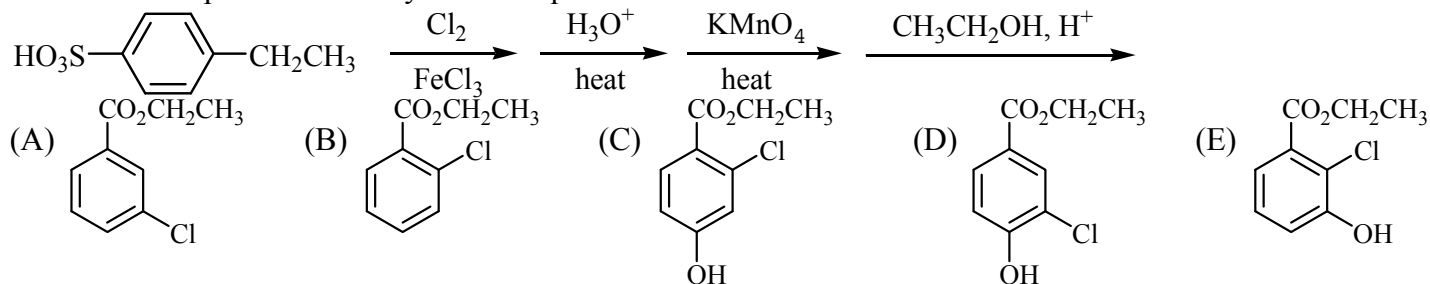
72. The syntheses shown here are unlikely to occur as written. What is **wrong** with each?



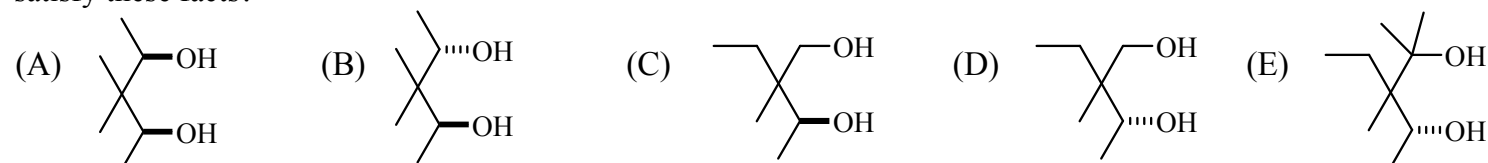
73. Which of the reactions below would **not** produce *n*-butylamine ?



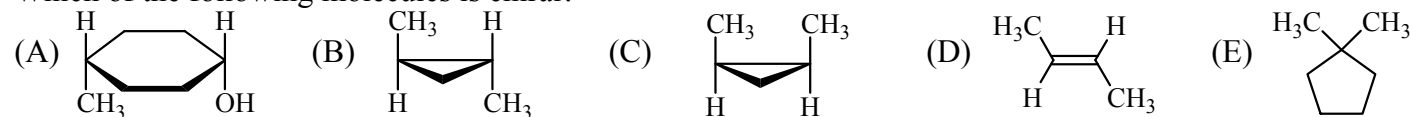
74. Determine the product of the synthetic sequence below.



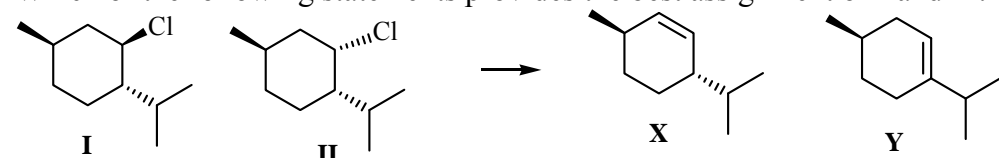
75. A chiral  $\text{C}_7\text{H}_{16}\text{O}_2$  diol is oxidized by PCC in  $\text{CH}_2\text{Cl}_2$  to an achiral  $\text{C}_7\text{H}_{12}\text{O}_2$  compound. Which of the following would satisfy these facts?



76. Which of the following molecules is chiral?

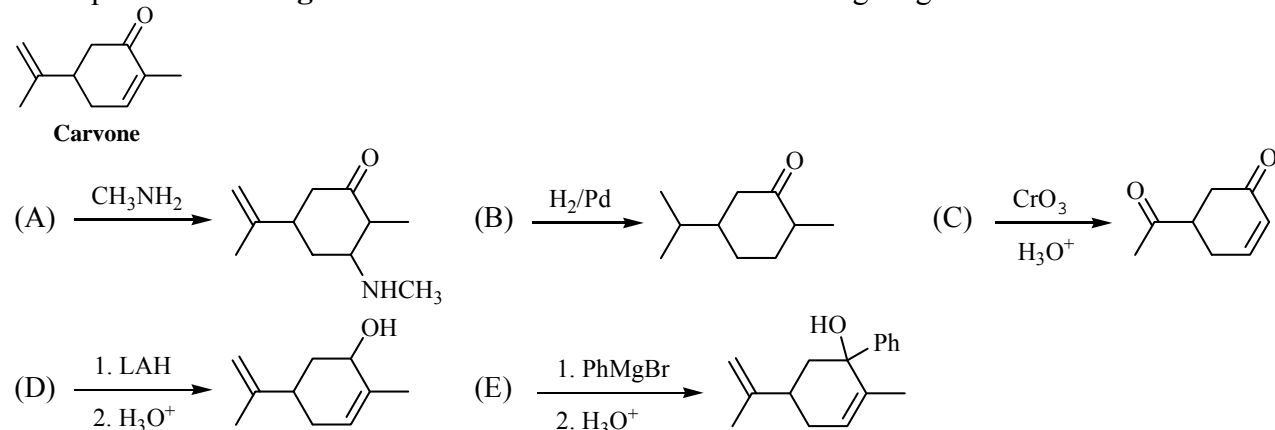


77. Stereoisomers **I** and **II** undergo E2 elimination on treatment with sodium ethoxide in ethanol. One isomer reacts 500 times faster than the other. Also, one isomer gives **X** as the only product, whereas the other gives **Y** together with some **X**. Which of the following statements provides the best assignment of **I** and **II**?

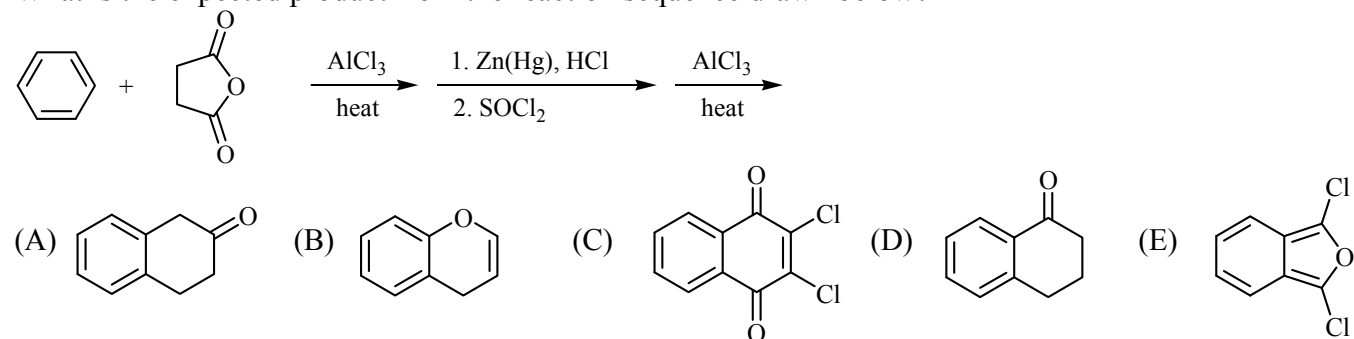


- (A) **II** reacts faster and gives both **Y** and **X** (B) **II** reacts faster and gives only **X**  
 (C) **I** reacts faster and gives both **Y** and **X** (D) **I** reacts faster and gives only **Y**  
 (E) **I** reacts faster and gives only **X**

78. What product is **wrong** when carvone is treated with the following reagents?



79. What is the expected product from the reaction sequence drawn below?



80. Only one of the following amines will lose its nitrogen atom as trimethyl amine by repeated Hofmann elimination reactions (exhaustive methylation followed by heating with  $\text{AgOH}$ ). Identify that amine.

