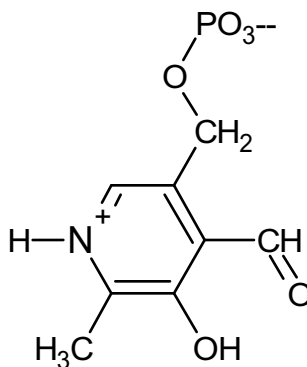


Practice MCAT Test I



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Preface

Practice MCAT Test I is designed to be similar to an actual MCAT exam, both in content and in presentation. However, in an actual MCAT exam you will be given each test booklet separately, and a table of contents is not provided. Explanatory answers to this practice test are available from the authors upon payment of the purchase price. We encourage you to study the answers, even for questions you have answered correctly. Completing the practice test and studying the answers will help you become familiar with the exam format and help you review and better understand the MCAT subject areas.

Practice MCAT Test I is offered through the internet for two reasons:

1. there are no printing and shipping costs so the price can be set low; and
2. potential buyers can “test-drive” before purchasing.

To order the solutions to this practice test, please visit <http://www.mcatprep.net> .

Practice MCAT Test I is in accordance with the 2003 changes in the MCAT.

Thank you for your interest in our publication and good luck on the MCAT.

Ken Evans
Charlene Bramwell

Cover: Structure of pyridoxal phosphate, which is a derivative of vitamin B₆. Pyridoxal phosphate is a coenzyme involved in many reactions in the metabolism of proteins, carbohydrates, and lipids. A prominent example of its role is in the transamination of amino acids.

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Physical Sciences

Time: 100 minutes

Questions: 1-77

Directions: Most questions in the Physical Sciences test are organized into groups, each preceded by a descriptive passage. After studying the passage, select the one best answer to each question. Some questions are not based on a descriptive passage. You should also select the one best answer to these independent questions. A periodic table is provided and you may consult it whenever you wish.

Periodic Table of the Elements

IA	IIA												IIIA	IVA	VA	VIA	VII A	VIII A	
1 H 1.0																			2 He 4.0
3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 17.0	10 Ne 20.2		
11 Na 23.0	12 Mg 24.3											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.5	18 Ar 40.0		
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8		
37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc 97.9	44 Ru 101	45 Rh 102	46 Pd 106	47 Ag 107	48 Cd 112	49 In 114	50 Sn 118	51 Sb 121	52 Te 127	53 I 126	54 Xe 131		
55 Cs 132	56 Ba 137	57-- 71 bel- ow	72 Hf 178	73 Ta 180	74 W 183	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 200	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 209	85 At 210	86 Rn 222		
87 Fr 223	88 Ra 226	89- 103 bel- ow	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une											

57 La 138	58 Ce 140	59 Pr 140	60 Nd 144	61 Pm 144	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 158	66 Dy 162	67 Ho 164	68 Er 167	69 Tm 168	70 Yb 173	71 Lu 175
89 Ac 227	90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259	103 Lr 262

Passage I

Below is a table showing some Standard State Reduction Potentials.

Half reaction	E (V)
$F_2 + 2e^- \rightarrow 2F^-$	2.87
$Cl_2 + 2e^- \rightarrow 2Cl^-$	1.36
$Br_2 + 2e^- \rightarrow 2Br^-$	1.09
$Ag^+ + e^- \rightarrow Ag$	0.80
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	0.77
$Cu^{2+} + 2e^- \rightarrow Cu$	0.34
$2H^+ + 2e^- \rightarrow H_2$	0.00
$Pb^{2+} + 2e^- \rightarrow Pb$	-0.13
$Ni^{2+} + 2e^- \rightarrow Ni$	-0.25
$Zn^{2+} + 2e^- \rightarrow Zn$	-0.76
$Na^+ + e^- \rightarrow Na$	-2.71

- What should happen when a piece of copper is placed in 1M HCl?
 - The copper is dissolved by the acid.
 - The copper is dissolved by the acid with the release of hydrogen gas.
 - The copper bursts into greenish flames.
 - Nothing happens.
- What should happen when a piece of lead is placed in 1M HCl?
 - The lead is dissolved by the acid.
 - The lead begins to dissolve with the release of hydrogen gas.
 - The lead bursts into flames.
 - Nothing happens.
- How many voltaic cells with a voltage greater than 2V can be made using the standard half-cell reactions listed?
 - 11
 - 9
 - 17
 - 15
- Suppose that the half-cell reaction $Ni^{2+} + 2e^- \rightarrow Ni$ is assigned to have a potential of 0.00 V. The standard reduction potential for the reduction of Br_2 would be?
 - 1.34 V
 - 0.84 V
 - 1.09 V
 - 1.25 V

- A voltaic cell is set up with F_2/F^- as one half cell and Br_2/Br^- as the other. What is the voltage of the cell at standard state?
 - 3.96 V
 - 1.78 V
 - 1.09 V
 - 2.87 V
- NaCl is melted in a beaker and electrolysis carried out. What is the minimum potential difference required to separate sodium and chlorine?
 - 4.07 V
 - 1.36 V
 - 1.36 V
 - 4.07 V
- If standard state oxidation potentials are used instead of standard state reduction potentials and the half reactions are listed in descending order, which one of the following would be true?
 - the lead reaction would be above the silver reaction
 - the fluorine reaction would be above the chlorine reaction
 - the iron reaction would be above the nickel reaction
 - the hydrogen reaction would be below the copper reaction

Passage II

A student is provided with a variety of electrical components and asked to perform certain tasks.

- She is provided with three 2 Ω resistors. How many different total resistances can be produced if all the resistors must be used in a circuit?
 - 3
 - 4
 - 5
 - 6
- What are the minimum and maximum total resistances produced above?
 - 0.67 Ω and 3 Ω
 - 1 Ω and 6 Ω
 - 1.33 Ω and 6 Ω
 - 0.67 Ω and 6 Ω
- What is the total resistance of two 2 Ω resistors in parallel connected to a third 2 Ω resistor in series?
 - 6 Ω
 - 1 Ω
 - 3 Ω
 - 1.33 Ω

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11. The student connects three $2\ \mu\text{F}$ capacitors in parallel. What is the total capacitance?

A. $0.67\ \mu\text{F}$
 B. $6\ \mu\text{F}$
 C. $1.5\ \mu\text{F}$
 D. $3\ \mu\text{F}$

12. The capacitors in parallel above are connected to a 6V d.c. voltage supply. What is the current in the circuit?

A. $0\ \text{A}$
 B. $1\ \text{A}$
 C. $1,000,000\ \text{A}$
 D. $2\ \text{A}$

13. The capacitors in parallel above are connected to an a.c. voltage of frequency $1\ \text{MHz}$. What is the impedance?

A. $1/(6\pi)\ \Omega$
 B. $1/(2\pi)\ \Omega$
 C. $1/(12\pi)\ \Omega$
 D. $1/(24\pi)\ \Omega$

14. The rms voltage of this circuit is $4\ \text{V}$. What is the rms current?

A. $48\pi\ \text{A}$
 B. $24\pi\ \text{A}$
 C. $40\pi\ \text{A}$
 D. $3\pi\ \text{A}$

15. A $2\ \text{milliHenry}$ inductor is connected to an a.c. voltage of frequency $1\ \text{MHz}$. What is the impedance?

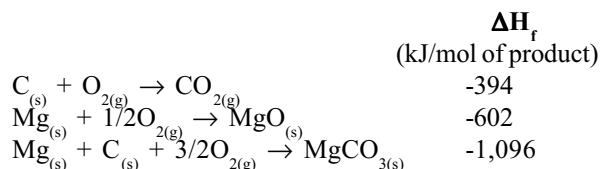
A. $2,000\pi\ \Omega$
 B. $4,000\pi\ \Omega$
 C. $400\pi\ \Omega$
 D. $40,000\pi\ \Omega$

Passage III

Hess's law is used to predict the heat energy released or consumed in chemical reactions. It states that the enthalpy change is the same regardless of whether a reaction occurs in one step or in several steps.

Below are some bond dissociation energies and enthalpies of formation.

	ΔH (kJ/mol)
C-H	415
O-H	464
O=O	498
C=O	745
C-C triple bond	837



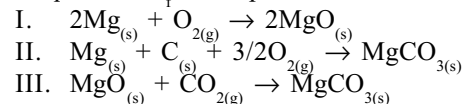
16. What is the approximate ΔH for the combustion of ethyne in oxygen (per mole of ethyne)?

A. $-996\ \text{kJ/mol}$
 B. $996\ \text{kJ/mol}$
 C. $-1,992\ \text{kJ/mol}$
 D. $1,992\ \text{kJ/mol}$

17. Which of the following has a ΔH_f of zero?

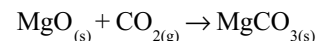
A. $\text{H}_{(g)}$
 B. $\text{I}_{2(g)}$
 C. $\text{Hg}_{(l)}$
 D. $\text{CO}_{(g)}$

18. Which of the following describes a reaction for which ΔH is equal to ΔH_f of the product?



A. I and II
 B. I and III
 C. II and III
 D. I only

19. What is ΔH for the reaction below?



A. $2,092\ \text{kJ/mol}$
 B. $-2,092\ \text{kJ/mol}$
 C. $100\ \text{kJ/mol}$
 D. $-100\ \text{kJ/mol}$

20. Hess's law is valid because enthalpy is a state function. Which of the following is not a state function?

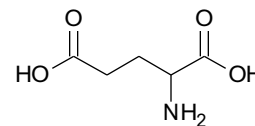
A. Volume
 B. Internal energy
 C. Work*
 D. Entropy

21. What is the formal charge on the carbon atom in the carbonate ion?

A. 0
 B. 1
 C. 2
 D. -2

Questions 87 to 92 are independent of any passage.

22. If the length of a pendulum is doubled, the period
- doubles.
 - quadruples.
 - triples.
 - increases by $\sqrt{2}$.
23. If the mass of a pendulum is doubled, the frequency
- doubles.
 - halves.
 - remains the same.
 - cannot be determined with the information given.
24. In the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$, the entropy
- increases.
 - remains the same.
 - decreases.
 - cannot be determined with the information given.
25. When the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$ is at equilibrium, the reaction is far to the right. The forward reaction must be
- ectoplasmic.
 - exothermic.
 - endothermic.
 - endergonic.
26. A man travels to a planet that has twice the radius of the earth and twice the mass. His weight, compared to his weight on earth, is
- double.
 - triple.
 - half.
 - cannot be determined with the information given.
27. With the relevant standard state reduction potentials and use of the Nernst Equation, one could calculate
- solubility products
 - equilibrium constants of reactions
 - the voltages of cells which are not in standard states
- I and II
 - I and III
 - II and III
 - All are true
28. Glycine is predominantly deprotonated at
- pH > 2.3
 - pH > 6.0
 - pH > 7.0
 - pH > 9.6
29. Which functional group in glycine is the strongest acid?
- $-NH_3^+$
 - $-COOH$
 - $-CH_2-$
 - None of the above
30. At which pH's does glycine exhibit the most buffering effect?
- 6.0 and 9.6
 - 2.3 and 6.0
 - 2.3 and 9.6
 - 6.0 and 7.4
31. The pH of cytoplasm is about 7.2. Which form of glycine predominates in cytoplasm?
- $H_3N^+-CH_2-COO^-$
 - H_2N-CH_2-COOH
 - $H_3N^+-CH_2-COOH$
 - $H_2N-CH_2-COO^-$
32. A small quantity of glycine is placed in a buffer solution of pH 2.0 and an electrical field is applied. What will happen to the glycine sample?
- It will migrate to the anode.
 - It will migrate to the cathode.
 - It will not migrate.
 - It will migrate, but in an unpredictable direction.
33. The structure of glutamic acid is shown below.



It has the following pK_a 's:

$-COOH$ $pK_a = 2.2$

$-CH_2-CH_2-COOH$ $pK_a = 4.7$

$-NH_3^+$ $pK_a = 9.7$

The isoelectric point of glutamic acid is

- between pH's 2 and 3.
- between pH's 3 and 4.
- between pH's 4 and 5.
- between pH's 5 and 6.

Passage IV

Glycine is an amino acid with the formula H_2N-CH_2-COOH . The pK_a of the $-COOH$ group is 2.3 and the pK_a of the $-NH_3^+$ group is 9.6. The isoelectric point is at pH 6.0.

Passage V

A 50 cm long hollow glass cylinder open at both ends is held in the air. A device that produces pure tones is placed adjacent to one end. The frequency of the sound is initially set very low then increased gradually. At a frequency of 320 Hz, the tube resonates.

34. What is the speed of sound in air during this experiment?
- 320 m/s
 - 640 m/s
 - 330 m/s
 - 160 m/s
35. The frequency is increased until resonance occurs again. What is this frequency?
- 320 Hz
 - 960 Hz
 - 640 Hz
 - 1,280 Hz
36. What is the next higher frequency at which resonance will occur?
- 1,920 Hz
 - 960 Hz
 - 990 Hz
 - 480 Hz
37. The end of the cylinder farthest away from the sound source is sealed with a glass cap. What are the three lowest resonant frequencies? (Assume the speed of sound is 340 m/s)
- 150 Hz, 510 Hz, 850 Hz
 - 170 Hz, 610 Hz, 850 Hz
 - 170 Hz, 510 Hz, 870 Hz
 - 170 Hz, 510 Hz, 850 Hz
38. The setup in the previous question is placed in a chamber filled with helium. What happens to the respective resonant frequencies?
- They remain the same.
 - They increase.
 - They decrease.
 - Some increase while others decrease.
39. The setup in the previous question is now subjected to a 20 K decrease in temperature. What happens to the respective resonant frequencies?
- They remain the same.
 - They increase.
 - They decrease.
 - Some increase while others decrease.

40. Two electronic sound sources are placed in a room. One emits a sound of frequency of 293 Hz and amplitude 4 units, the other 297 Hz and 10 units. What is the frequency of the beats produced? (Here amplitude is measured in arbitrary units at a certain equidistant point in the room.)
- 8 Hz
 - 590 Hz
 - 2 Hz
 - 4 Hz
41. A third sound source is added with a frequency of 300 Hz and amplitude 3 units. What is the minimum instantaneous amplitude produced as a result of all three sound sources operating at the same time?
- 9 units
 - 3 units
 - 11 units
 - 2 units

Passage VI

The concept of solubility is very important in chemistry. Central to calculations regarding solubility is the solubility product (K_{sp}), which for a salt is the product of the concentrations of the ions in a saturated solution, with each concentration raised to a power equal to the coefficient of that ion in the balanced equation for the solubility equilibrium.

42. A beaker contains equal concentrations of Mn^{2+} and Ni^{2+} ions. It is found that NiS can be selectively precipitated by adding a certain quantity of K_2S to the beaker. If the K_{sp} of NiS is 3.2×10^{-19} , the K_{sp} of MnS must be
- less than 3.2×10^{-19}
 - greater than 3.2×10^{-19}
 - 3.2×10^{-19}
 - This cannot be determined with the information provided.
43. $MgF_{2(s)}$ is added to a beaker of water until there is an amount at the bottom that will not dissolve. What is the concentration of F^- (K_{sp} of MgF_2 is 6.5×10^{-9})?
- $2.4 \times 10^{-3} M$
 - $1.6 \times 10^{-9} M$
 - $2.4 \times 10^{-4} M$
 - $1.2 \times 10^{-3} M$

44. What is the concentration of F^- in the above solution if $MgCl_2$ is added so that the final concentration of Mg^{2+} is $0.1 M$?
- $0.05 M$
 - $5.0 \times 10^{-4} M$
 - $5.0 \times 10^{-3} M$
 - $2.5 \times 10^{-4} M$

Questions 110 to 114 are independent of any passage.

45. A police car is travelling towards you at $50 m/s$. Its siren is emitting a sound of $400 Hz$. You are travelling in the opposite direction to the police car at $20 m/s$. What is the frequency of the sound you hear (velocity of sound in air is $330 m/s$)?
- $470 Hz$
 - $485 Hz$
 - $450 Hz$
 - $500 Hz$
46. Referring to the previous question, what is the frequency you hear after you pass each other?
- $326 Hz$
 - $500 Hz$
 - $400 Hz$
 - $375 Hz$
47. A cannon is angled so that for every 4 feet traveled horizontally, it goes up vertically 3 feet. When a shell is fired, the speed on leaving the muzzle is $500 m/s$. How far does the shell travel (ignore air resistance)?
- $20 km$
 - $18 km$
 - $12 km$
 - $24 km$
48. A $10 kg$ block is accelerated at $2 m/s^2$ up a frictionless plane inclined at 30 degrees to the horizontal. The force acting parallel to the plane pushing the block upwards is
- $100 N$
 - $25 N$
 - $50 N$
 - $70 N$
49. When a ${}_5B^8$ atom decays by the emission of a positron, the resultant atom is
- ${}_4Be^8$
 - ${}_6C^8$
 - ${}_5B^8$
 - ${}_3Li^4$

Passage VII

The space shuttle is conducting an experiment with a large parallel plate capacitor in the vacuum and weightlessness of outer space.

50. A d.c. voltage of $12 V$ is applied across the plates. The capacitance is $1.5 F$. What is the charge on each plate?
- $12 C$
 - $18 C$
 - $8 C$
 - $0.8 C$
51. When the plates are moved farther apart
- voltage decreases and the charge on each plate decreases.
 - voltage decreases and the charge on each plate remains the same.
 - voltage remains the same and the charge on each plate remains the same.
 - voltage remains the same and the charge on each plate decreases.
52. A thick sheet of glass (which acts as a dielectric) is placed between the plates. The potential difference and charge on each plate should
- remain the same and increase, respectively.
 - remain the same and decrease, respectively.
 - remain the same in both cases.
 - increase in both cases.
53. If the area of each plate is tripled
- capacitance remains the same, while electric field intensity increases.
 - capacitance and electric field intensity remain the same.
 - capacitance is tripled, while electric field intensity remains the same.
 - capacitance and electric field intensity are tripled.
54. An astronaut takes a hollow metallic ball out of a pouch and, by means of electrostatic induction, gives it a net positive charge of $2 C$. What is the electric field intensity inside the ball when it is between the plates and far away from the plates, respectively?
- $2 N/C$ and $6 N/C$
 - cannot be determined with the information provided and $0 N/C$
 - $6 N/C$ and $2 N/C$
 - cannot be determined with the information provided.

55. The ball is taken far away from the plates. What is the electric field intensity at a point 4 m away from the center of the ball?
- k/4 N/C
 - k/2 N/C
 - k/6 N/C
 - k/8 N/C
56. The astronaut now adjusts the capacitor plates so that they are 3 m apart. The voltage is still 12 V. Another ball that has a negligible radius, a net positive charge of 2 C, and a mass of 100 g is held inside the capacitor against the positive plate. It is then released. What is the kinetic energy of the ball when it reaches the negative plate?
- 12 J
 - 6 J
 - 24 J
 - 36 J
57. What is the force acting on the ball?
- 8 N
 - 4 N
 - 16 N
 - The force will vary depending on its relative position between the plates
58. What will happen to the force on the ball and its kinetic energy if the voltage is doubled?
- They quadruple.
 - They double.
 - They stay the same.
 - Force is doubled; kinetic energy is quadrupled.
59. The voltage is turned back down to 12 V. Another metal ball of mass 500 g is now given a net positive charge of 2 C and held at the positive plate. It is then released and it accelerates to the negative plate. What is its kinetic energy when it reaches the negative plate?
- 24 J
 - 120 J
 - 4.8 J
 - 12 J

Passage VIII

Chemical reactions can be viewed from a thermodynamic perspective. Changes in enthalpy (ΔH) and entropy (ΔS) are the two driving forces that determine whether a reaction is spontaneous. Gibbs free energy (ΔG) combines these two factors in one equation,

$$\Delta G = \Delta H - T \Delta S$$

Compound	ΔH_f° (kJ/mol)	S° (J/mol-K)
$N_{2(g)}$	0	192
$H_{2(g)}$	0	131
$NH_{3(g)}$	-46	192

60. What is ΔH° for the reaction,
- $$N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$$
- 46 kJ
 - 92,000 J
 - 0 J
 - 138 kJ
61. What is ΔS° for the reaction,
- $$N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$$
- 201 J/K
 - 192 J/K
 - 131 J/K
 - 201 J/K
62. At 25°C, the reaction $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$ is
- spontaneous.
 - not spontaneous.
 - rapid.
 - slow.
63. If the temperature is increased, the equilibrium position of the reaction should
- increase.
 - stay the same.
 - shift to the left.
 - shift to the right.
64. At 25°C, myoglobin is a globular protein. At high enough temperatures, however, it will become denatured as in the following reaction,
- globular myoglobin \rightarrow denatured myoglobin
- Given that $\Delta H = -175$ kJ/mol and $\Delta S = -397$ J/mol, what is the minimum temperature at which globular myoglobin will become denatured?
- 43°C
 - 97°C
 - 126°C
 - 168°C

Passage IX

A biologist is studying the ecology of a lake. He uses a glass-bottomed boat, an ordinary camera, two magnifying glasses, and a compound microscope for his study. In preparing for his project, he assembled the following data.

$$n_{\text{vacuum water}} = 1.33$$

$$n_{\text{vacuum glass}} = 1.5$$

$$n_{\text{vacuum microscope oil}} = 1.5$$

focal length of camera lens = 5 cm

focal length of each magnifying glass = 12 cm

65. When light travels from air to water,
- its frequency increases.
 - its frequency decreases.
 - its wavelength increases.
 - its wavelength decreases.
66. What is $n_{\text{water}} n_{\text{glass}}$?
- 1.42
 - 0.89
 - 1.125
 - 1.00
67. What is the maximum angle of incidence at the water/glass interface for a light ray to be seen by the biologist on board the boat?
- $\sin^{-1} 0.67$
 - $\sin^{-1} 0.75$
 - $\sin^{-1} 1$
 - $\sin^{-1} 0$
68. He photographs some geese 5 m away. In order to have a focused image, what must be the distance between the lens and the film in the camera?
- 7 cm
 - 8 cm
 - slightly less than 5 cm
 - slightly more than 5 cm
69. He examines a butterfly that has landed on the boat. With the magnifying glass held 4 cm from the butterfly, what is the magnification obtained?
- 1.5
 - 3
 - 12
 - 18
70. He places the two magnifying glasses in contact with each other. The combined focal length is
- 4 cm.
 - 24 cm.
 - 12 cm.
 - 6 cm.
71. He examines an underwater object by immersing a magnifying glass in the water. The focal length of the magnifying glass
- decreases.
 - increases.
 - remains the same.
 - changes unpredictably.
72. He collects specimens in containers and examines one of them under the microscope in the laboratory. At a magnification of 1,000 he finds that although the image is larger, the level of detail is not improved (i.e. there is “empty magnification”). He decides to use the technique of oil immersion to increase the resolution (i.e. the small space between the objective lens and the slide cover slip is filled with oil). Oil immersion increases the resolving power by
- filtering out scattered light.
 - acting as another lens, magnifying the image even more.
 - decreasing the wavelength of light entering the aperture of the objective lens.
 - increasing the frequency of light entering the aperture of the objective lens.
- Questions 138 to 142 are independent of any passage.**
73. A 20 kg child is playing on a swing of negligible mass. It is attached to its pivot point with two 3 m ropes. The maximum speed of the child during a swing cycle is found to be 3 m/s. What is the maximum tension in each rope?
- 200 N
 - 260 N
 - 60 N
 - 130 N
74. A brick is resting on a concrete surface. Which of the following is true?
- the force required to overcome static friction is greater than the force required to overcome dynamic friction
 - the force required to overcome dynamic friction is greater than the force required to overcome static friction
 - friction is proportional to the component of weight acting normally on the surface
- All are correct.
 - I and II are correct.
 - I and III are correct.
 - II and III are correct.
75. In the context of electrochemistry, “standard state” refers to:
- All solutions are 1 M; all gases have a partial pressure of 1 MPa; temperature is 273K.
 - All solutions are 0.1 M; all gases have a partial pressure of 0.1 MPa; temperature is 273K.
 - All solutions are 0.1 M; all gases have a partial pressure of 0.1 MPa.
 - All solutions are 1 M; all gases have a partial pressure of 0.1 MPa.

76. What is the pH of a 100 ml solution of 0.1M acetic acid to which 50ml of 0.1M NaOH has been added (K_a of acetic acid is 1.8×10^{-5})?
- A. 5
 - B. 7
 - C. 3
 - D. 10
77. Referring to the previous question, what happens to the pH when a further 10 ml of 0.1M NaOH is added?
- A. It goes up to 6 or 7.
 - B. It goes down.
 - C. It stays the same.
 - D. It goes up but only slightly.

STOP. IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK. YOU MAY GO BACK TO ANY QUESTION IN THE PHYSICAL SCIENCES TEST BOOKLET.

Verbal Reasoning

Time: 85 minutes

Questions: 78-137

Directions: There are nine passages, each followed by several questions. After reading a passage, select one best answer to each question. If you are uncertain of an answer, eliminate the alternatives that you know to be incorrect and then select an answer from the remaining alternatives.

Passage I

Turbulent flow over a boundary is a complex phenomenon for which there is no really complete theory even in simple laboratory cases. Nevertheless, a great deal of experimental data have been collected on flows over solid surfaces, both in the laboratory and in nature, so that, from an engineering point of view at least, the situation is fairly well understood. The force exerted on a surface varies with the roughness of that surface and approximately with the square of the wind speed at some fixed height above it. A wind of 10 meters per second (about 20 knots, or 22 miles per hour) measured at a height of 10 meters will produce a force of some 30 tons per square kilometer on a field of mown grass or of about 70 tons per square kilometer on a ripe wheat field. On a really smooth surface, such as glass, the force is only about 10 tons per square kilometer.

When the wind blows over water, the whole thing is much more complicated. The roughness of the water is not a given characteristic of the surface but depends on the wind itself. Not only that, the elements that constitute the roughness - the waves - themselves move more or less in the direction of the wind. Recent evidence indicates that a large portion of the momentum transferred from the air into the water goes into waves rather than directly into making currents in the water; only as the waves break, or otherwise lose energy, does their momentum become available to generate currents, or produce Ekman layers. Waves carry a substantial amount of both energy and momentum (typically about as much as is carried by the wind in a layer about one wavelength thick), and so the wave-generation process is far from negligible.

A violently wavy surface belies its appearance by acting, as far as the wind is concerned, as though it were very smooth. At 10 meters per second, recent measurements seem to agree, the force on the surface is quite a lot less than the force over mown grass and scarcely more than it is over glass; some observations in light winds of two or three meters per second indicate that the force on the wavy surface is less than it is on a surface as smooth as glass. In some way the motion of the waves seems to modify the airflow so that air slips over the surface even more freely than it would without the waves. This seems not to be the case at higher wind speeds, above about five meters per second, but the force remains strikingly low compared with that over other natural surfaces.

One serious deficiency is the fact that there are no direct observations at all in those important cases in which the wind speed is greater than about 12 meters per second and has had time and fetch (the distance over water) enough to raise substantial waves. The few indirect studies indicate that the apparent roughness of the surface increases

somewhat under high-wind conditions, so that the force on the surface increases rather more rapidly than as the square of the wind speed.

Assuming that the force increases at least as the square of the wind speed, it is evident that high-wind conditions produce effects far more important than their frequency of occurrence would suggest. Five hours of 60-knot storm winds will put more momentum into the water than a week of 10-knot breezes. If it should be shown that, for high winds, the force on the surface increases appreciably more rapidly than as the square of the wind speed, then the transfer of momentum to the ocean will turn out to be dominated by what happens during the occasional storm rather than by the long-term average winds.

78. According to the passage, several hours of storm winds (60 miles per hour) over the ocean would
- be similar to the force exerted by light winds for several hours over glass.
 - create an ocean roughness which reduces the force exerted by the high winds.
 - eventually affect ocean current.
 - create a force not greater than 6 times the force of a 10 mile-per-hour wind.
79. According to the passage, a rough-like ocean surface
- is independent of the force of the wind.
 - has the same force exerted against it by high and light winds.
 - is more likely to have been caused by a storm than by continuous light winds.
 - is a condition under which the approximate square of wind speed can never be an accurate figure in measuring the wind force.
80. The author indicates that, where a hurricane is followed by light winds of 10 meters per second or less,
- ocean current will be unaffected by the light winds
 - ocean current will be more affected by the hurricane winds than the following light winds
 - the force of the light winds on the ocean would be less than that exerted on a wheat field
- The correct combination is:
- I only
 - II and III
 - I and III
 - II only

81. The main purpose of the passage is to discuss
- oceanic momentum and current.
 - the effects of wind on bodies of water.
 - wind blowing over water as related to causing tidal flow.
 - experiments in wind force.
82. The author would be incorrect in concluding that the transfer of momentum to the ocean is dominated by the occasional storm if
- high-speed winds slipped over waves as easily as low speed winds.
 - waves did not move in the direction of wind.
 - the force exerted on a wheat field was the same as on mown grass.
 - the force of wind under normal conditions increased as the square of wind speed.
83. A wind of 10 meters per second measured at a height of 10 meters will produce a force close to 30 tons per square kilometer on which of the following?
- Unmown grass
 - Mown grass
 - Glass
 - Water

Passage II

There are four arguments that may be used in the justification of the practice of euthanasia in its various forms. These four arguments are the expression of the four possible motives that may lie behind the intention to kill that is the essential element in euthanasia.

1. Argument from compassion

This argument maintains that when a patient is faced with a situation of intolerable misery and distress arising from an incurable disease, it is kinder to end his life rather than to allow him to live and to continue to suffer. Euthanasia is thus proposed out of compassion for the person whose life it is felt has become unbearable.

2. Argument from the right to die

According to this argument, a person with an incurable disease that is causing pain and distress that cannot be relieved by any available means has the right to demand euthanasia. This right to demand their death is often regarded as part of a human autonomy by which patients have the right to make decisions about their treatment by health care professionals.

3. Argument from social progress

This argument claims that society has a eugenic obligation to eliminate the physically and mentally unfit from amongst its members. This view is based on the utilitarian social

theory known as social darwinianism. It was a popular view in the earlier presentation of the case for euthanasia, but it is less popular today since its consequences were seen in the social and racial policies of Nazi Germany. However, it may still be used to justify the euthanasia of handicapped infants or adults suffering from severe dementia or a persistent vegetative state.

4. Argument from economic necessity

Another social argument has been added to the case for euthanasia in recent years with the recognition of the high cost of the medical and social care of those people who might be candidates for euthanasia. The cost of the care of this type of patient can be very high indeed and it is thus argued that the legalization and practice of euthanasia would release money which could then be used for the improvement of the health services for other sections of the population.

We have now set out briefly the arguments used in favor of the practice of euthanasia, but we cannot decide for or against its use on the basis of these arguments alone. To do so would be to ignore the important assumptions that underlie its practice and to disregard the serious nature of the deliberate killing of another person which euthanasia involves. Before we look at the case against euthanasia we must therefore look at these assumptions. There are at least twelve assumptions, which may be set out in three separate categories: philosophical, medical, and legal, as outlined below.

1. Philosophical

That man has a right to die

That the value of human life is measurable

That human life can be dealt with in the same way as animal life

That suffering can have no beneficial function

That an unmixed motive of compassion can be guaranteed

That a request for euthanasia is always rational and reliable

2. Medical

That medical diagnosis and prognosis are always certain

That the degree of suffering of another person can always be realistically and objectively assessed

That effective alternative methods for the relief of suffering are not available

That euthanasia is the justifiable duty of a doctor

3. Legal

That the legalization of euthanasia can control its abuse

That euthanasia can be clearly distinguished from murder

It is obvious from the sheer number and significant nature of these assumptions that they cannot be ignored and that any decision to legalize the practice of euthanasia is one

that will have serious ethical, legal, social, and professional implications. The four arguments in favor of euthanasia given above are of unequal value. The third and fourth arguments have implications that do much to weaken their force. The argument from social progress has been destroyed by the racial policies and genocidal activities of Nazi Germany. The argument from economic necessity is not acceptable because it reduces human life and personal happiness to the impersonal terms of money and expediency, which are not the terms in which the human situation should be assessed. The argument based on an alleged right to die arises from a confusion of rights and liberties. Man is free to end his life when he chooses, but this does not mean that he has a right to do so. Such a right does not exist ethically, legally, or socially.

We are left then with the argument from compassion. This is especially strong in cases where relatives have been obliged to watch a loved one suffer unbearable agony and to listen to repeated requests for them to end it all by euthanasia. Nevertheless, it remains doubtful how far compassion can be allowed to over-ride the other principles that govern human behavior in any given situation in the present state of human nature and society. If an action is ethically wrong, or even legally wrong, then it is clearly doubtful whether an appeal to a motive of compassion can make it ethically or legally right.

If we look at the assumptions that we have suggested underlie the practice of euthanasia, it is clear that a number of them are of questionable validity. This is particularly true of those we have classified as medical.

In addition to these considerations there are a number of arguments which can be advanced against the practice of euthanasia which should be considered.

Euthanasia is unnecessarily radical. It destroys the problem rather than solving it. By ending the life of the patient it deprives him of hope and any opportunity of regretting or reversing his decision. In cases of intolerable pain it destroys the whole nervous system instead of the part in which the pain is felt.

Euthanasia is ethically indefensible. There is an ethical principle of totality that allows a part to be sacrificed for the sake of the whole. There is no corresponding principle that allows the whole to be sacrificed for the sake of the part. That would be an illogical position and certainly an unethical one.

Euthanasia is legally inadmissible. No country has so far legalized euthanasia, although The Netherlands has come very near to doing so. The danger in the legalization of euthanasia lies in the possibility of its abuse. Legislation

on abortion in Britain has failed to control the abuse of abortion, and similar legislation on euthanasia cannot be expected to control its abuse either. The legal problem is how to distinguish euthanasia from murder.

Euthanasia is practically unworkable. The various recent schemes that have been suggested in Britain for the practice of euthanasia have all assumed that it would be administered by doctors. However, doctors are trained to preserve life and not to destroy it. It is probable that there are few doctors who would wish to be known as the executioners of their patients, for this would undermine their doctor-patient relationship.

Euthanasia is increasingly unnecessary. When euthanasia was first advocated in Britain and other countries in the 1930s, the concept and practice of palliative medicine was unknown. Doctors had no guidance and little experience in the alleviation of distressing symptoms arising from incurable disease. The most effective use of opioids to control pain was not understood and other methods of relieving pain and other symptoms were not known. In these circumstances, euthanasia often seemed to be the only solution to the patient's problems. The situation is very different today and the use of euthanasia is increasingly unnecessary and even outdated as a method of coping with distressing symptoms and situations. For this we have to thank the pioneers of the hospice movement.

Even if we reject euthanasia as inadmissible ethically, this cannot be the end of the matter. The problem of the control of suffering still remains. What then ought we to do?

The first thing to do is to try to prevent the occurrence of those situations for which euthanasia has been suggested, by anticipating their onset and forestalling their development. The second thing is to make available to our patients all the methods of relief and control of distressing symptoms that are now available. The third thing is to encourage and promote research aimed at the improvement of the means of relief of suffering, so that new methods might be discovered and old ones made more effective. Finally, we must recognize that the care of the sufferer and the relief of his suffering are never purely medical concerns, and we must thus provide for his physical, mental, and spiritual welfare by involving all the caring professions in an effective and sensitive approach to the patient and his family in order to support them in their situation of need.

84. According to the passage, the essential element in euthanasia is
- the alleviation of distressing symptoms arising from incurable disease.
 - the intention to kill.
 - to provide no heroic measures.
 - to make remaining life as happy and fulfilling as possible.
85. From the passage, it can be inferred that
- there are 12 assumptions underlying the concept of euthanasia.
 - there are 4 arguments used to justify euthanasia.
 - euthanasia is absolutely unacceptable regardless of a patient's situation.
 - euthanasia is illegal.
- I, II, and III are correct.
 - I and II are correct.
 - I, II, and IV are correct.
 - All are correct.
86. An appropriate title for this passage may be
- "Put him out of his misery"
 - "Dying with dignity"
 - "Facing one's mortality"
 - "Euthanasia: the arguments for and against"
87. Which of the following statements is supported by the passage?
- Patients have the right to die.
 - Incurable patients have the duty to die an early death.
 - Patients have the freedom to die.
 - Patients have the privilege to die.
88. Generally, the author seems to be
- against euthanasia.
 - supportive of euthanasia.
 - neither for nor against euthanasia.
 - ignorant of the main issues surrounding euthanasia.
89. According to the passage, arguments in favor of euthanasia include all of the following except
- eugenics.
 - scarce resources could be put to better use.
 - human autonomy.
 - a patient's inability to pay for health care.

90. Which of the following statements is not supported by the passage?
- Some countries have legalized euthanasia.
 - Pain and suffering can be controlled.
 - The part can be sacrificed for the whole.
 - The strongest argument for euthanasia is compassion.

Passage III

Cardiac radionuclide imaging is easily tolerated, relatively easy to perform, requires only moderately expensive equipment, and exposes patients to less radiation than X-ray studies that give comparable information. The procedures fall into 2 broad categories: those that show the myocardium or myocardial infarcts (perfusion studies), and those that allow evaluation of ventricular function and wall motion (ventriculography). They are widely used to evaluate certain patients with coronary artery disease (CAD), valvular or congenital disease, cardiomyopathy, and other cardiac disorders.

Myocardial perfusion imaging usually uses thallium 201 (Tl 201), a radioactive cation that is useful because it behaves as a potassium analog. Following IV administration, thallium 201 rapidly leaves the vascular compartment and enters the cells in proportion to initial blood flow. About 4% of the dose enters the myocardium temporarily; this small accumulation shows the heart in relief against the low surrounding background of lung activity. After thallium 201 reaches its initial distribution, an equilibrium occurs between myocardial thallium 201 and that in the blood and other structures (e.g., skeletal muscles, liver, kidneys, etc). During this equilibration, the concentration in viable myocardium will change to reflect steady-state regional blood flow. Thus, if thallium 201 is injected into someone who is exercising, defects in the myocardial distribution will occur in nonviable areas (e.g., infarct, scar) and in viable regions with reduced blood flow (e.g., an ischemic zone distal to a hemodynamically significant coronary stenosis). Subsequently, after several hours with the patient at rest, the distribution will change. If the original thallium 201 myocardial defect was caused by a nonviable scar, it will appear unchanged. However, if it was an ischemic area, the late image is likely to show disappearance or diminution of the initial defect. This is the basis for detecting regions of exercise-induced ischemia by sequential thallium 201 studies.

The exercise test usually is done on a conventional treadmill, using the Bruce protocol or a similar exercise schedule, with patient monitoring. If no contraindications arise, exercise is continued to at least 85% of the age-predicted maximum, and thallous chloride Tl 201 (2 to 3.5 mCi) is injected while the patient is at peak exercise. The patient is encouraged to continue at this level for an additional 30 to

60 sec to allow for distribution of radioactivity under the influence of exercise-related blood flow patterns.

An alternative to exercise testing is the use of the coronary vasodilator, dipyridamole. This drug increases myocardial blood flow in normal coronary arteries but not in arteries distal to a stenosis, resulting in increased ^{201}Tl uptake in the normal distribution or relatively decreased activity in the stenotic distribution. The resulting image thus will appear similar to one following exercise. Imaging of ^{201}Tl injected 3 to 5 min after IV dipyridamole 0.56 mg/kg has a sensitivity for CAD similar to that of exercise testing. IV dipyridamole is now approved in the USA for clinical use. Oral dipyridamole also has been used but is less reliable because of variability in drug absorption. Dipyridamole-induced ischemia can be reversed by IV aminophylline.

Imaging of ^{201}Tl distribution in the heart may be done as a series of planar images using a conventional scintillation camera or as a tomographic reconstruction following acquisition by a rotating camera system, using single photon emission computed tomography (SPECT). Digital image enhancement, with or without quantification, usually is performed before the study is interpreted.

Compared with coronary angiography as the standard, the sensitivity of conventional ^{201}Tl imaging for significant CAD is 80 to 85% and its specificity is more than 90%. Stress redistribution ^{201}Tl imaging is more sensitive and specific than is ECG stress testing in detecting significant coronary ischemia; when ^{201}Tl results and stress ECG findings are coupled, the sensitivity for CAD increases to more than 90%. Thus, ^{201}Tl imaging can be used for initial evaluation of certain patients with chest pain (i.e., mainly those with pain of uncertain origin), to determine the functional significance of coronary artery stenosis or collateral vessels demonstrated by angiography, and to follow up procedures such as bypass surgery, transluminal angioplasty, or thrombolysis. It is also useful for prognostication after acute myocardial infarction, and for assessing patients on digitalis, with bundle branch block, who cannot exercise, or females.

SPECT improves the overall sensitivity for CAD to at least 90%, with most of the gain in detection of inferior and posterior abnormalities that are not well visualized on conventional images. Identification of the vessels responsible for the defects also is improved. Small areas of infarction that cannot be identified as persistent perfusion defects on planar images can be seen on the tomographic slices. In addition, the mass of both infarcted and viable myocardium can be quantified, which is valuable in determining prognosis.

91. Which of the following statements is not supported by the passage?
- Patients who cannot exercise can be given dipyridamole.
 - A disadvantage of cardiac radionuclide imaging is the considerable exposure to ionizing radiation.
 - SPECT is more sensitive than planar imaging.
 - Oral dipyridamole is less reliable than IV dipyridamole.
92. On the whole, the author seems to be
- against the use of cardiac radionuclide imaging.
 - indifferent about whether cardiac radionuclide imaging is used or not.
 - not very knowledgeable about the subject.
 - supportive of the judicious use of cardiac radionuclide imaging.
93. Which of the following statements are supported by the passage?
- Cardiac radionuclide imaging requires a very heavy investment in equipment.
 - Cardiac radionuclide imaging consists of two broad subgroups: perfusion studies and ventriculography.
 - Thallium 201 emits radiation, which is detected by special cameras.
 - To a certain extent, coronary angiography and ECG stress testing could be considered substitutes for cardiac radionuclide perfusion imaging.
- II, III, IV
 - I, II, III
 - I, III, IV
 - I, II, IV
94. In performing cardiac perfusion studies, the passage implies that
- the patient is injected with Tl ^{201} , scanned, exercised, then scanned again.
 - the patient is scanned, injected with Tl ^{201} , exercised, then scanned again.
 - the patient is exercised, injected with Tl ^{201} , scanned, then scanned again after resting.
 - the patient is injected with Tl ^{201} , exercised, scanned, then scanned again after resting.
95. Which of the following statements is not supported by the passage?
- Tl ^{201} is radioactive.
 - Tl ^{201} can be used for ventriculography.
 - Tl ^{201} can be used to assess the functional significance of coronary artery disease.
 - Tl ^{201} is a cation.

96. Which of the following statements are supported by the passage?
- I. To a certain extent cardiac radionuclide imaging and ECG stress testing complement each other.
 - II. The concentration of Tl 201 may be the same in normal and ischemic myocardium when the patient is at rest.
 - III. SPECT is more specific than planar cardiac radionuclide imaging.
 - IV. The purpose of exercise in cardiac radionuclide imaging is to detect viable regions of myocardium with reduced blood flow.
- A. II, III, IV
 - B. I, II, III
 - C. I, III, IV
 - D. I, II, IV
97. The passage supports or implies which of the following statements?
- I. Using dipyridamole is less sensitive than exercising the patient.
 - II. Tl 201 distributes itself in tissues in proportion to blood flow.
 - III. IV adrenaline can reverse dipyridamole-induced ischemia.
- A. I
 - B. I and III
 - C. II
 - D. I, II, and III

Passage IV

Though the modern history of oil begins in the latter half of the nineteenth century, it is the twentieth century that has been completely transformed by the advent of petroleum. In particular, three great themes underlie the story of oil.

The first is the rise and development of capitalism and modern business. Oil is the world's biggest and most pervasive business, the greatest of the great industries that arose in the last decades of the nineteenth century. Standard Oil, which thoroughly dominated the American petroleum industry by the end of that century, was among the world's very first and largest multinational enterprises. The expansion of the business in the twentieth century encompassing everything from wildcat drillers, smooth-talking promoters, and domineering entrepreneurs to great corporate bureaucracies and state-owned companies embodies the twentieth-century evolution of business, of corporate strategy, of technological change and market development, and indeed of both national and international economies. Throughout the history of oil, deals have been done and momentous decisions have been made among men, companies, and nations sometimes with great calculation

and sometimes almost by accident. No other business so starkly and extremely defines the meaning of risk and reward and the profound impact of chance and fate.

As we look toward the twenty-first century, it is clear that mastery will certainly come as much from a computer chip as from a barrel of oil. Yet the petroleum industry continues to have enormous impact. Of the top twenty companies in the Fortune 500, seven are oil companies. Until some alternative source of energy is found, oil will still have far-reaching effects on the global economy; major price movements can fuel economic growth or, contrarily, drive inflation and kick off recessions. Today, oil is the only commodity whose doings and controversies are to be found regularly not only on the business page but also on the front page. And, as in the past, it is a massive generator of wealth for individuals, companies, and entire nations.

The second theme is that of oil as a commodity intimately intertwined with national strategies and global politics and power. The battlefields of World War I established the importance of petroleum as an element of national power when the internal combustion machine overtook the horse and the coal-powered locomotive. Petroleum was central to the course and outcome of World War II in both the Far East and Europe. The Japanese attacked Pearl Harbor to protect their flank as they grabbed for the petroleum resources of the East Indies. Among Hitler's most important strategic objectives in the invasion of the Soviet Union was the capture of the oil fields in the Caucasus. But America's predominance in oil proved decisive, and by the end of the war German and Japanese fuel tanks were empty. In the Cold War years, the battle for control of oil between international companies and developing countries was a major part of the great drama of decolonization and emergent nationalism. The Suez Crisis of 1956, which truly marked the end of the road for the old European imperial powers, was as much about oil as about anything else. "Oil power" loomed very large in the 1970s, catapulting states heretofore peripheral to international politics into positions of great wealth and influence, and creating a deep crisis of confidence in the industrial nations that had based their economic growth upon oil. And oil was at the heart of the first post-Cold War crisis of the 1990s - Iraq's invasion of Kuwait.

Yet oil has also proved that it can be fool's gold. The Shah of Iran was granted his most fervent wish, oil wealth, and it destroyed him. Oil built up Mexico's economy, only to undermine it. The Soviet Union - the world's second largest exporter - squandered its enormous oil earnings in the 1970s and 1980s in a military buildup and a series of useless and, in some cases, disastrous international adventures. And the United States, once the world's largest producer and still its largest consumer, must import half of its oil supply,

weakening its overall strategic position and adding greatly to an already burdensome trade deficit - a precarious position for a great power.

With the end of the Cold War, a new world order is taking shape. Economic competition, regional struggles, and ethnic rivalries may replace ideology as the focus of international and national conflict, aided and abetted by the proliferation of modern weaponry. But whatever the evolution of this new international order, oil will remain the strategic commodity, critical to national strategies and international politics.

A third theme in the history of oil illuminates how ours has become a "Hydrocarbon Society" and we, in the language of anthropologists, "Hydrocarbon Man." In its first decades, the oil business provided an industrializing world with a product called by the made-up name of "kerosene" and known as the "new light," which pushed back the night and extended the working day. At the end of the nineteenth century, John D. Rockefeller had become the richest man in the United States, mostly from the sale of kerosene. Gasoline was then only an almost useless by-product, which sometimes managed to be sold for as much as two cents a gallon, and, when it could not be sold at all, was run out into rivers at night. But just as the invention of the incandescent light bulb seemed to signal the obsolescence of the oil industry, a new era opened with the development of the internal combustion engine powered by gasoline. The oil industry had a new market, and a new civilization was born.

In the twentieth century, oil, supplemented by natural gas, toppled King Coal from his throne as the power source for the industrial world. Oil also became the basis of the great postwar suburbanization movement that transformed both the contemporary landscape and our modern way of life. Today, we are so dependent on oil, and oil is so embedded in our daily doings, that we hardly stop to comprehend its pervasive significance. It is oil that makes possible where we live, how we live, how we commute to work, how we travel - even where we conduct our courtships. It is the lifeblood of suburban communities. Oil (and natural gas) are the essential components in the fertilizer on which world agriculture depends; oil makes it possible to transport food to the totally non-self-sufficient megacities of the world. Oil also provides the plastics and chemicals that are the bricks and mortar of contemporary civilization, a civilization that would collapse if the world's oil wells suddenly went dry.

For most of this century, growing reliance on petroleum was almost universally celebrated as a good, a symbol of human progress. But no longer. With the rise of the environmental movement, the basic tenets of industrial

society are being challenged; and the oil industry in all its dimensions is at the top of the list to be scrutinized, criticized, and opposed. Efforts are mounting around the world to curtail the combustion of all fossil fuels - oil, coal, and natural gas - because of the resultant smog and air pollution, acid rain, and ozone depletion, and because of the specter of climate change. Oil, which is so central a feature of the world as we know it, is now accused of fueling environmental degradation; and the oil industry, proud of its technological prowess and its contribution to shaping the modern world, finds itself on the defensive, charged with being a threat to present and future generations.

Yet Hydrocarbon Man shows little inclination to give up his cars, his suburban home, and what he takes to be, not only the conveniences, but also the essentials of his way of life. The peoples of the developing world give no indication that they want to deny themselves the benefits of an oil-powered economy, whatever the environmental questions. And any notion of scaling back the world's consumption of oil will be influenced by the extraordinary population growth ahead. In the 1990s, the world's population is expected to grow by one billion people - 20 percent more people at the end of this decade than at the beginning - with most of the world's people demanding the "right" to consume. The global environmental agendas of the industrial world will be measured against the magnitude of that growth. In the meantime, the stage has been set for one of the great and intractable clashes of the 1990s between, on the one hand, the powerful and increasing support for greater environmental protection and, on the other, a commitment to economic growth and the benefits of Hydrocarbon Society, and apprehensions about energy security.

98. By "Hydrocarbon Man," the author means
- our society's daily life is pervaded by and dependent on oil.
 - Man's advanced understanding of the chemistry and uses of oil.
 - Man is a terrible polluter.
 - Man is chemically composed mainly of carbon and hydrogen.
99. According to the passage, in the decade of the 1990s, the population of the world is expected to
- double.
 - increase by 20%.
 - increase by two billion.
 - increase by 15%.
100. Which of the following statements can be inferred from the passage?
- The USA's position as a super power would be strengthened if it were less dependent on oil.

- II. Oil has been an important commodity throughout recorded history.
- III. If the world population explosion can be controlled, the future environmental challenges anticipated can be more easily overcome.

- A. I only
- B. I and II
- C. I and III
- D. I, II and III

101. Which of the following is not described as a disadvantage of the oil industry?
- A. Environmental pollution
 - B. The deterioration of inner cities
 - C. Potential political instability
 - D. Potential economic instability
102. The main purpose of the passage is to
- A. discuss possible alternative energy sources.
 - B. analyze the economics of oil.
 - C. discuss the role oil has had in the rising nationalism of former colonies.
 - D. discuss the impact oil has had in modern history.
103. Which of the following statements is not supported by the passage?
- A. Seven oil companies are part of the top twenty companies in the Fortune 500.
 - B. Before the internal combustion engine, the horse and coal-powered locomotive were predominantly in use.
 - C. The USA imports a third of its oil supply.
 - D. J.D. Rockefeller became rich primarily from the sale of kerosene.

Passage V

Many readers assume that, as a neoclassical literary critic, Samuel Johnson would normally prefer the abstract, the formal, and the regulated to the concrete, the natural, and the spontaneous in a work of literature. Yet any close reading of Johnson's criticism shows that Johnson is not blind to the importance of the immediate, vivid, specific detail in literature; rather, he would underscore the need for the telling rather than the merely accidental detail.

In other ways, too, Johnson's critical method has much in common with that of the Romantics, with whom Johnson and, indeed, the entire neoclassical tradition, are generally supposed to be in conflict. Johnson was well aware, for example, of the sterility of literary criticism that is legalistic or pedantic, as was the case with the worst products of the neoclassical school. His famous argument against the slavish

following of the "three unities" of classical drama is a good example, as is his defense of the supposedly illegitimate "tragicomic" mode of Shakespeare's latest plays. Note, in particular, the basis of that defense: "That this is a practice contrary to the rules of criticism," Johnson wrote, "will be readily allowed; but there is always an appeal from criticism to nature."

The sentiment thus expressed could easily be endorsed by any of the Romantics; the empiricism it exemplifies is a vital quality of Johnson's criticism, as is the willingness to jettison "laws" of criticism when to do so makes possible a more direct appeal to the emotions of the reader. Addison's Cato, highly praised in Johnson's day for its "correctness," is damned with faint praise by Johnson: "Cato affords a splendid exhibition of artificial and fictitious manners, and delivers just and noble sentiments, in diction easy, elevated, and harmonious, but its hopes and fears communicate no vibration to the heart." Wordsworth could hardly demur.

Even on the question of poetic diction, which, according to the usual interpretation of Wordsworth's 1800 Preface to the Lyrical Ballads, was the central area of conflict between Romantic and Augustan, Johnson's views are surprisingly "modern." In his Life of Dryden, he defends the use of a special diction for poetry, it is true; but his reasons are all-important. For Johnson, poetic diction should serve the ends of direct emotional impact and ease of comprehension, not those of false profundity or grandiosity. "Words too familiar," he wrote, "or too remote, defeat the purpose of a poet. From those sounds which we hear on small or on coarse occasions, we do not easily receive strong impressions, or delightful images; and words to which we are nearly strangers, whenever they occur, draw that attention on themselves which they should transmit to things." If the poetic diction of the neoclassical poets, at its worst, erects needless barriers between reader and meaning, that envisioned by Johnson would do just the opposite: it would put the reader in closer contact with the "things" that are the poem's subject.

104. The author of the passage demonstrates his ideas concerning Johnson mainly by
- A. contrasting Johnson's critical methods with those of his contemporaries.
 - B. citing specific illustrations drawn from Johnson's work.
 - C. alluding to contemporary comments concerning Johnson's theories.
 - D. quoting Johnson's remarks about the critical approaches prevalent in his own day.

105. The passage implies that the judging of literary works according to preconceived rules
- tends to lessen the effectiveness of much modern literary criticism.
 - is the primary distinguishing mark of the neoclassical critic.
 - was the primary neoclassical technique against which the Romantics rebelled.
 - characterizes examples of the worst neoclassical criticism.
106. The passage implies that the neoclassical critics generally condemned
- Shakespeare's use of the "tragicomic" literary mode.
 - the slavish following of the "three unities" in drama.
 - attempts to judge literary merit on the basis of "correctness."
 - artificiality and abstraction in literary works.
107. According to the passage, Johnson's opinion of Addison's Cato was
- roundly condemnatory.
 - somewhat self-contradictory.
 - ultimately negative.
 - effusively adulatory.
108. According to the passage, Johnson's views concerning the use of a special diction in the writing of poetry were
- "modern" in their rejection of a clear-cut division between the diction of poetry and that of prose.
 - "neoclassical" in their emphasis on the use of language with a direct emotional appeal for the reader.
 - "Romantic" in their defense of the idea that a special diction for poetry could be stylistically effective.
 - "modern" in their underlying concern for the impact of the literary work on the sensibility of the reader.

109. Which one of the following statements best summarizes the main point of the passage?
- Although many of Johnson's critical opinions resemble those of the neoclassical critics, his basic concerns are closer to those of the Romantics.
 - The usual classification of Johnson as a member of the neoclassical school of criticism is based on an inaccurate evaluation of his critical theories and ideals.
 - The Romantic critics were mistaken in their belief that the critical ideas they formulated represented a departure from those propounded by Johnson.
 - Although many of Johnson's critical opinions resemble those of the Romantic critics, his basic concerns are closer to those of the neoclassical critics.

Passage VI

In the USA, the medical care system has developed without strong direction from the local, state, or federal governments. The result is a confusing mix of ways in which services are organized and paid for. The per capita cost of medical care and the proportion of the gross domestic product used for medical care are higher in the USA than anywhere else in the world, yet approximately 15% of Americans still have no financial protection from the costs of medical care. Moreover, the medical care cost inflation rate is one of the highest in the world. Because of the high costs of medical care, a variety of cost-containment strategies have been developed. Two that are used extensively today in the USA are the prospective payment system and managed care.

Prospective Payment System

The prospective payment system (PPS) based on diagnosis-related groups has changed the way hospitals are reimbursed and the way hospitals and physicians think about the provision of care. Each hospital admission is classified into a diagnosis-related group (DRG). A DRG may consist of a single diagnosis or procedure, or it may consist of several diagnoses or procedures that, on average, have similar hospital costs per admission. An uncomplicated delivery of an infant, for example, is coded as DRG #313, and a non-radical hysterectomy in a woman who is under the age of 70 and has no complicating condition is coded as DRG #355.

DRGs were first developed to enable hospitals to look for cost "outliers." For example, hospitals could analyze and identify those physicians who regularly generated greater than average costs for care coded as DRG #313. The hospitals could then try to find out why these physicians generated excess costs and to devise methods to control these costs in the future. The federal government, however,

decided to use the DRG system to pay hospitals on the basis of a prospectively determined average cost for each of the more than 470 DRGs. This system began to be used in the treatment of Medicare patients in 1983. Although there is no federal requirement that hospital payers other than Medicare use the DRG system for reimbursement, several states requested and received federal permission to incorporate DRGs into their own prospectively determined rate-setting programs. When this happened, all third-party payers in the state had to conform to the same prospectively determined rates. This is referred to as an all-payer system. Note that the hospital is actually reimbursed after a specific type of care is given; however, the amount of payment for the specific type of care is decided prospectively (in advance). If a hospital can find a way to reduce the costs and provide the care for less than the amount reimbursed by the PPS, it can retain the excess amount. If a hospital is inefficient and has higher than average costs for a hospital admission, it will lose money on that admission. Because hospitals with the strongest administrative teams and data systems are best able to keep costs below PPS reimbursements, there is a tendency for the strong hospitals to get stronger and the weak hospitals to get weaker. There have been some good results from the PPS. For example, there are now more and better data than before, and hospitals have a greater ability than before to find unnecessary costs. The full impact of the PPS on the quality of medical care has not been determined. There is evidence that some patients are being discharged sooner than desirable, but no major change in medical care quality has been clearly discernible. Often, early discharge merely passes the medical care problems (and therefore costs) down the line to the care institutions receiving the patients from the hospital: the home, home care agencies, and nursing homes.

The PPS added urgency to an already-growing trend to move as much medical care as possible out of acute general hospitals and into ambulatory surgery and diagnostic centers. Because the PPS does not apply to ambulatory procedures, providers in ambulatory settings could set their own rates.

Managed Care

In an analysis of the social structure of medical care, Freidson claimed that the characteristic that uniquely defines the “professions,” including medicine, is autonomy in practice. With the advent of managed care, also known as utilization management, the trend appears to be away from physician autonomy in some aspects of medical practice, such as deciding which patients can be admitted to the hospital and how long they may remain there. Managed care is a system of administrative controls, the goal of which is to reduce the costs of medical care.

In managed care, hospitalizations will be reimbursed by a third-party payer only if the payer has approved the admission beforehand (pre-admission review and certification). If a patient is admitted through the emergency department, this admission is reviewed the next day and if not approved by the third-party payer, reimbursement may not be paid (emergency department admission review). Once a patient is in the hospital, the length of stay is closely monitored, and the patient may be forced to leave the hospital as soon as possible (concurrent review and discharge planning). Other aspects of managed care include second opinions before elective surgery; use of primary care physicians as gatekeepers (all referrals to specialists are required to be approved by the patient’s primary care practitioner); high-cost case management; benefit design; and the provision of financial incentives for physicians to practice economically.

The current medical care system in the USA has many costly inefficiencies, which may not be able to be corrected without major changes, such as national or regional health insurance, a single-payer system, or a combination of both. Nevertheless, the possibly high initial costs of shifting to a new system, the uncertainty of its benefits, and the complex political compromises that would probably be required suggest that, in the immediate future, there will be no major, rapid change in the organization or financing of medical care in the USA.

110. Managed care

- I. reduces the autonomy of physicians
- II. is a system of administrative controls
- III. seeks to better manage the utilization of health services

- A. I and II are correct.
- B. II and III are correct.
- C. I, II, and III are correct.
- D. None are correct.

111. According to the passage, the primary purpose of PPSs and HMOs is

- A. to ensure more Americans have financial protection from health care costs.
- B. to control health care costs.
- C. to improve the quality of health care.
- D. to make greater profits.

112. If the costs of hospitalization for two medical different conditions are approximately the same, then

- A. they would be in the same DRG.
- B. they would be in different DRGs.
- C. they may or may not be in the same DRG.
- D. they would be in the same DRG but in different subsections.

113. Which of the following is supported by the passage?
- The PPS has resulted in a decrease in the quality of care.
 - The PPS has helped stimulate the trend from in-patient care to outpatient care.
 - DRGs are groups of diagnoses in which the same organs and organ systems are affected.
 - DRGs were first used for Medicaid patients.
114. The passage indicates that
- while managed care endeavors to prevent unnecessary use of health services, PPSs endeavor to keep the cost of each hospital stay within reasonable bounds.
 - while PPSs endeavor to prevent unnecessary use of health services, managed care endeavors to keep the cost of each hospital stay within reasonable bounds.
 - Managed care and PPSs endeavor to prevent unnecessary use of health services.
 - Managed care and PPSs endeavor to keep the cost of each hospital stay within reasonable bounds.
115. Managed care and PPSs
- are mutually exclusive.
 - can co-exist in the same health care system.
 - necessarily occur together.
 - are unique to the USA.
116. Freidson claimed that the characteristic that uniquely defines the professions is
- a relatively high income.
 - monopoly on certain knowledge and skills.
 - autonomy in practice.
 - restricted entry.

Passage VII

The large majority of our fellow citizens care as much about literature as they care about archaeology or the program of the legislature. They do not entirely ignore it; they are not quite indifferent to it. But their interest in it is faint and perfunctory; or, if their interest happens to be intense, it is spasmodic. Ask the two hundred thousand persons whose enthusiasm made the vogue of a popular novel ten years ago what they think of that novel now, and you will gather that they have utterly forgotten it.

In the face of this, one may ask: Why does the great and universal fame of classic authors continue? The answer is that the fame of classic authors is entirely independent of the majority. Do you suppose that if the fame of Shakespeare depended on the man in the street it would survive for a fortnight? The fame of classic authors is originally made, and it is maintained, by a passionate few.

Even on those rare occasions when a first class author has enjoyed immense success during his lifetime, the majority has never appreciated him so sincerely as they have appreciated second-rate writers. The first-class author has always been reinforced by the ardor of the passionate few. And in the case of an author who emerged into glory after his death, this has been due solely to the obstinate perseverance of the few. They kept on savoring him, and talking about him, and buying him, and they generally behaved with such eager zeal, and they were so authoritative and sure of themselves, that at last the majority grew accustomed to the sound of his name and placidly agreed to the proposition that he was a genius. The majority really did not care very much either way.

What causes the passionate few to make such a fuss about literature? There can be only one reply. They find a keen and lasting pleasure in it. They enjoy literature as some people enjoy beer. And what are the qualities of a book that give keen and lasting pleasure to the passionate few? This is a question so difficult that it has never yet been completely answered. You may talk lightly about truth, insight, knowledge, wisdom, humor, and beauty, but these comfortable words do not really carry you very far, for each of them has to be defined, especially the first and last. It is all very well for Keats in his airy manner to assert that beauty is truth, truth beauty, and that is all he knows or needs to know. I, for one, need to know a lot more. And I shall never know. Nobody, not even a great critic like Hazlitt or Sainte-Beuve, has ever finally explained why he thought a book beautiful.

A classic is a work that gives pleasure to the minority that is intensely and permanently interested in literature. It lives on because the minority, eager to renew the sensation of pleasure, is eternally curious and is therefore engaged in an eternal process of rediscovery. A classic does not survive for any ethical reason. It does not survive because it conforms to certain canons or rules. It survives because it is a source of pleasure.

117. Which of the following would be the most appropriate title for the passage above?
- The Laws of Literary Greatness
 - What Makes a Classic a Classic?
 - The Sources of Shakespeare's Reputation.
 - The Indifferent Majority and the Fate of Literature
118. According to the passage, the most fundamental source of value in a work of literature is its
- evocation of beauty.
 - truth to nature.
 - ability to give pleasure.
 - adherence to aesthetic canons or rules.

119. According to the passage, the role of the majority in establishing certain literary works as classics is primarily
- antagonistic.
 - passive.
 - supportive.
 - commercial.
120. It can be inferred that the author of the passage would probably consider the novel mentioned in the first paragraph as an example of
- the kind of classic work that attains genuine renown only after its author's death.
 - a work that unites truth and beauty in the Keatsian sense.
 - the work of a "second-rate" writer.
 - the kind of book that is truly appreciated only by the passionate few.
121. When the author talks about a writer emerging "into glory," he is referring primarily to
- a first-class author who enjoys immense success during his lifetime.
 - a second-rate writer whose works do not become popular until after his death.
 - any writer who attains great personal fame while his works remain little read.
 - a first-rate writer whose works are acclaimed posthumously as classics.
122. It can be inferred from the passage that the author considers the aesthetic principle embodied in Keats' assertion that "beauty is truth, truth beauty" to be
- mysteriously apt.
 - vague and inadequate.
 - unorthodox but refreshingly simple.
 - closely akin to the aesthetic principles of Hazlitt and Sainte-Beuve.
123. With which of the following statements would the author be most likely to agree?
- A great work of literature embodies admirable moral as well as artistic qualities.
 - A book that the average reader can appreciate is one that is likely to be of lasting value.
 - Those who truly love literature share certain tastes, though they cannot clearly define them.
 - If an author is destined to attain classic status, his worth is usually immediately obvious.

Passage VIII

The three major characteristics of malignant neoplasms in humans are first, that growth is not subject to the normal

constraints of the parent tissue. Second, that cancers always show a degree of anaplasia, which is a loss of cellular differentiation. This is associated with a lack of some of the functions of the normal, differentiated parent tissue. Third, that cancers have the property of metastasis, that is the ability to spread from the site of origin to distant tissues. While these features are present in most human malignant neoplasms, some of these properties are not absolutely distinct from normal tissues. Thus it is true that the normal regulatory mechanisms controlling growth are defective in cancer, but that is not to say that there is no check or constraint on the pattern of growth of human neoplasms. Similarly, although we regard the most anaplastic of cancers as 'undifferentiated' in the sense that they seem to have arisen from the more primitive precursors of the differentiated tissue; many cancers none the less do retain some of the functions of the mature tissues. Metastasis is, however, a property unique to cancer. Furthermore, it is metastasis that in most instances kills the patient and understanding the biology of metastasis is one of the central problems of cancer research.

There is now a considerable body of evidence that most human neoplasms are monoclonal in origin. This means that the original oncogenic event affected a single cell, and that the tumor is the result of growth from that one cell.

One problem with the concept of monoclonality is that it has sometimes led investigators to believe that there is a far greater uniformity of behavior of cancer than is in fact the case. In spite of the monoclonal origin of neoplasms, significant heterogeneity appears to arise during the course of development of the tumors. This has important implications for treatment and for understanding the nature of metastases.

How does heterogeneity arise? If the tumor is polyclonal in origin then diversity can be explained on this basis. If monoclonal, other explanations are needed. It has been postulated that the occurrence of malignancy confers an inherent genetic instability on the clonogenic cells and that, during the course of the growth of the tumor, phenotypic differences in clonogenic cells develop. Thus there is the development of mutants, some of which survive and undergo still further changes, whereas others, depending on their ability to survive hormonal, biochemical, or immunological adversity, die. The mature tumor can therefore be envisaged as being composed of cells that are monoclonal in origin, but diverse in capacity to metastasize and to resist cytotoxic drugs and immune attack.

Normal tissues vary greatly in both the rate of cell division and the numbers of cells that are actively proliferating. An idealized representation of the way in which proliferation occurs in a normal tissue is given by stem or progenitor

cells supplying a proliferating pool of cells which follow a particular differentiation pathway. These become mature cells that are held to be incapable of further division and subsequently die. While this model may apply to human cancers, it is possibly an oversimplification. Tumors probably do contain progenitor and mature cells but it is not clear whether cell renewal in a tumor comes from a small progenitor fraction. While the progeny of stem cell division go through successive divisions, their number increases, but the number of further divisions they are 'programmed' to make declines concomitantly, and they eventually die. It is apparent that the stimulus to cell death and its mechanism is a programmed process under genetic control.

A normal tissue grows and develops to a point where cell proliferation is balanced by cell death and the tissue remains static in size, unless subjected to a changing environment, e.g. hormonal influences. In a cancer, on the other hand, the regulatory mechanisms appear defective and the tumor gradually increases in size. Nevertheless, this does not mean a rapid growth.

The malignant cell is able to escape from normal control of growth. When normal tissues proliferate, they do so to the point where cell-to-cell contact appears to be able to exert an inhibiting role on further mitosis. In contrast, transformed cells continue to grow after they have become confluent, that is to say, there is a loss of contact inhibition of cell division. Tumors will grow and increase in size when planted subcutaneously in immune suppressed mice while normal tissues will not. The nature of the cell surface glycoproteins differs from normal cells with an increase in sialic acid content, and alterations in the surface charge. The locomotor apparatus of cells (microfilaments and microtubules) become disorganized and the cells alter their shape and show membrane movement at sites of contact with normal cells. At the same time the tumor cells become locally invasive, although the biochemical basis of this property is ill understood.

As the tumor grows, tumor blood vessels proliferate probably under the influence of tumor angiogenesis factors, which stimulate capillary formation. One of the results of local invasion is that tumor cells can enter vascular and other channels of the body and metastasize.

Having penetrated the vascular compartment, tumor cells must withstand the process of arrest in the capillary bed of an organ and then start to divide. At this site the tumor cell must leave the capillary bed of the new tissue. To do this the tumor cell must pass through the capillary endothelium and survive attack by host defense mechanisms such as phagocytic cells and so-called natural killer cells.

The capacity for invasion and colonization of distant tissues

varies with different classes of tumor. Likewise, a given tumor type has a different tendency to metastasize in different individuals. More disconcertingly, there may be heterogeneity in the metastatic potential of its constituent cells, even within a single tumor in an individual.

The idea that human tumors might be recognized as foreign to the host has obvious attractions, since if an immune response to the tumor occurred as part of the disease, or could be provoked artificially, there would be opportunities for using such an immune response diagnostically or therapeutically. However, until tumor antigens are defined and the nature of the immune response to them, if any, is elucidated, active specific immunity to cancer remains an elusive goal.

124. Which of the following statements is not supported by the passage?

- A. Most human neoplasms are monoclonal in origin.
- B. The cells that comprise a tumor can be very different from each other.
- C. All cancers grow uncontrollably.
- D. The capacity for metastasis varies with different types of cancer.

125. According to the passage:

- I. metastasis is a property that distinguishes cancer from non-cancer.
 - II. the cell surface glycoproteins of cancer cells have increased salicylic acid content compared to normal cells.
 - III. the microfilaments and microtubules of cancer cells become disorganized.
- A. I is correct.
 - B. II is correct.
 - C. I and II are correct.
 - D. I and III are correct.

126. Which statement can be inferred from the passage:

- A. Cancer is brought about by many cells turning malignant at the same time.
- B. Natural killer cells and phagocytic cells may be able to prevent metastasis.
- C. Immunological therapies are one of the most effective cancer treatments.
- D. Tumors are able to grow regardless of how little blood supply there may be.

127. Which of the following statements is supported by the passage:

- A. Cancers grow very rapidly.
- B. Chemotherapy is often used to combat metastasis.
- C. Prevention is better than cure.
- D. Cancer cells lose contact inhibition of cell division.

128. The most appropriate title for this passage would be
- “Cancer Treatment”
 - “Cancer”
 - “Cancer Biology”
 - “The Causes of Cancer”
129. Which of the following statements is not supported by the passage?
- Stem cells are the least differentiated cells in a tissue.
 - Unlike their progeny, stem cells are not ‘programmed’ to die.
 - Stem cells are the only cells in a tissue that can divide.
 - Natural cell death is under genetic control.
130. Which of the following statements is/are implied or inferred by the passage:
- Cancer may involve abnormalities of microtubules and microfilaments.
 - Cancer may involve abnormalities of the cell membrane.
 - Cancer may involve abnormalities of the Golgi apparatus.
- I, II and III
 - I and II
 - II and III
 - None of them

Passage IX

The poet and critic W. H. Alden once wrote, “The critical opinions of a writer should always be taken with a large grain of salt. For the most part, they are manifestations of his debate with himself as to what he should do next and what he should avoid.” While Alden denies the applicability of a poet’s critical theories to poetry in general, he emphasizes the usefulness of those theories as a key to the poet’s own work. In this paper, I have used the criticism of Donald Davie as a gloss on Davie’s own poetry, taking the criticism not necessarily as an objective description of the real workings of the poetry but, as Alden might suggest, as an indication of Davie’s goals as a poet.

Over the twenty-odd years of Davie’s career, these goals have undergone no fundamental change. The style of poetry Davie described as his ideal in his critical essay *Purity of Diction in English Verse*, published in 1953, is the style Davie’s own poetry still aspires to in his most recent work. The changes in Davie’s poetry over the years have been directed toward not an abandonment but a fuller realization of the goal he envisaged in the early fifties, which he summarized as, in Eliot’s phrase, “the perfection of a common language.”

Calvin Bedient, who regards Davie’s critical theories as wrongheaded, sees Davie’s best poetry as a tacit repudiation of those theories; Davie’s finest lyrics, according to Bedient, were written in spite of, not because of, his critical ideas. For Bedient, the growth of Davie’s poetic skill reflects his gradual “escape” from the influence of his own poetic ideals. But a more careful reading of Davie suggests that, on the contrary, Davie’s best poems are not ones in which he deviates from his stated poetic ideals but rather those in which he comes closest to embodying them; and this he has done with increasing frequency in his recent work.

The canons of Davie’s criticism are basically four:

(1) Poetry should be “pure” in diction, which involves, primarily, economy and restraint in the use of metaphor. The poet, according to Davie, is concerned with “purifying” as well as “expanding” the language; that is, not only must he coin new ways of seeing the world (new metaphors and images), but he must also preserve and refurbish the old ways. Good poetry does this through the use of rhythm and sound and through vivid, specific nouns and verbs that help to revivify the meanings buried in dead metaphors and images.

(2) Poetry should adhere closely to the twin models of, on the one hand, “prose and careful conversation,” and on the other, the usages of the great poets of the past. The poet must be chary of drastic innovation without a strong reason.

(3) Poetry should use, as far as possible, the syntax of ordinary language.

(4) Poetry should handle its meanings as clearly and explicitly as possible, drawing distinctions that are at once subtle and lucid. Poetry should be intelligent as well as passionate.

Davie makes it clear that poetry that follows these canons may not be the only real poetry, or even the best poetry; as he points out, this kind of “prosaic strength” is most characteristic not of great poets but of good ones, and Davie lists Gower, Greville, Denham, Goldsmith, Jonson, and Cowper as examples. But it is this company of solid, intelligible, honest poets that Davie aspires to join, and it is by their standards that we must accordingly judge Davie’s work.

131. In the passage, the author is primarily concerned with
- illustrating and defending the basic critical theories set forth by Davie.
 - demonstrating that the style of Davie’s poetry is a repudiation of Davie’s critical theories.
 - showing the relevance of Davie’s critical writing to an understanding of Davie’s poetry.
 - indicating how Davie’s poetry both fails and succeeds at bearing out Davie’s critical theories.

132. It can be inferred that the author's attitude toward Calvin Bedient's evaluation of Davie's critical theories is one of
- A. frank disagreement.
 - B. reluctant agreement.
 - C. bemused uncertainty.
 - D. partial acceptance.
133. The author of the passage and Calvin Bedient are in agreement on the idea that Davie's poetry
- A. represents an attempt to escape from the influence of literary theories.
 - B. embodies Davie's own critical ideas.
 - C. helps to clarify Davie's critical theories.
 - D. has improved in quality over the course of his career.
134. The author is interested in Davie's 1953 work *Purity of Diction in English Verse* primarily for the light it sheds on
- A. the work of the poets Davie admires.
 - B. Davie's literary ideals.
 - C. Calvin Bedient's analysis of Davie's work.
 - D. Eliot's influence on Davie's criticism.
135. According to the passage, Davie's concept of "purity of diction" refers mainly to
- A. the use of the syntax of ordinary language.
 - B. the acceptance of well-written prose as a model for poetic style.
 - C. clarity and explicitness in the presentation of ideas.
 - D. a restrained use of metaphor.
136. The poets referred to in the last paragraph are mentioned primarily because they
- A. wrote the kind of poetry that Davie regards as the greatest.
 - B. were influential in the formation of Davie's critical theories.
 - C. helped to shape Davie's own poetic style.
 - D. wrote poetry that, in Davie's view, exemplifies certain of his critical theories.
137. The remainder of the paper from which the passage is excerpted is most likely to contain
- A. a more detailed explanation of Davie's critical theories.
 - B. an assessment of the validity of Davie's critical standards in the study of English poetry.
 - C. an analysis of Davie's poetry in the light of his own critical theories.
 - D. an in-depth analysis of the works of the poets listed in the last paragraph.

STOP. IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK. YOU MAY GO BACK TO ANY QUESTION IN THE VERBAL REASONING TEST BOOKLET.

Writing Sample

Time: 60 minutes total;
30 minutes per essay, each separately timed.

Essay Topic 1

The function of the press should be to report only the facts of daily events, not to influence the public's opinion about those facts.

Write a unified essay in which you perform the following tasks. Explain what you think the above statement means. Describe a specific situation when the press might be justified in attempting to influence the public's opinion. Discuss what you think determines whether or not the press should attempt to influence public opinion.

Essay Topic 2

Technology solves many problems, but in the process often creates new problems.

Write a unified essay in which you perform the following tasks. Explain what you think the above statement means. Describe a specific situation in which a technology might **not** create a new problem. Discuss what you think determines when a technology's benefits outweigh its potential problems.

Biological Sciences

Time: 100 minutes

Questions: 138-214

Directions: Most questions in the Biological Sciences test are organized into groups, each preceded by a descriptive passage. After studying the passage, select the one best answer to each question. Some questions are not based on a descriptive passage. You should also select the one best answer to these independent questions. A periodic table is provided and you may consult it whenever you wish.

Periodic Table of the Elements

IA	IIA												IIIA	IVA	VA	VIA	VII A	VIII A	
1 H 1.0																			2 He 4.0
3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 17.0	10 Ne 20.2		
11 Na 23.0	12 Mg 24.3											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.5	18 Ar 40.0		
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8		
37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc 97.9	44 Ru 101	45 Rh 102	46 Pd 106	47 Ag 107	48 Cd 112	49 In 114	50 Sn 118	51 Sb 121	52 Te 127	53 I 126	54 Xe 131		
55 Cs 132	56 Ba 137	57-- 71 bel- ow	72 Hf 178	73 Ta 180	74 W 183	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 200	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 209	85 At 210	86 Rn 222		
87 Fr 223	88 Ra 226	89- 103 bel- ow	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une											

57 La 138	58 Ce 140	59 Pr 140	60 Nd 144	61 Pm 144	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 158	66 Dy 162	67 Ho 164	68 Er 167	69 Tm 168	70 Yb 173	71 Lu 175
89 Ac 227	90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259	103 Lr 262

Passage I

The next few questions refer to the following table.

Quantity	Formula	Units
Molarity	moles of solute / L of soln	M
Molality	moles of solute / kg of solvent	m
Wgt per vol (w/v)	g of solute / dL of soln	%
Equivalents per litre	moles x charge / L of soln	Eq/L
Osmolarity	moles of all particles / L of soln	Osm/L
Osmolality	moles all particles / kg of solvent	Osm/kg

138. Normal or isotonic saline (0.85% NaCl) is commonly used to treat dehydration. Which of the following methods would produce normal saline?

- A. 850 mg of NaCl(s) is weighed out and placed in a volumetric flask, which is then filled with distilled water to the 100 mL mark.
- B. 850 mg of NaCl(s) is weighed out and placed in a volumetric flask, which is then filled with distilled water to the 1 L mark.
- C. 8.5 g of NaCl(s) is weighed out and placed in a volumetric flask, which is then filled with distilled water to the 100 mL mark.
- D. 85 mg of NaCl(s) is weighed out and placed in a volumetric flask, which is then filled with distilled water to the 100 mL mark.

139. What is the molarity of the above solution?

- A. 0.015 M
- B. 0.15 M
- C. 1.5 M
- D. 0.5 M

140. What concentration of a glucose solution would also be isotonic?

- A. 2%
- B. 3%
- C. 5%
- D. 10%

141. Red blood cells are mixed in with the glucose solution. What happens to the cells?

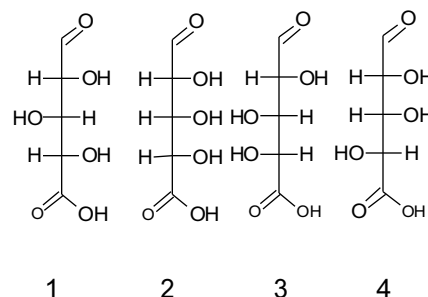
- A. They swell.
- B. They shrink.
- C. They remain the same size and shape.
- D. They change shape.

142. A patient's serum is found to have a Ca^{2+} concentration of 0.010%. This is equivalent to

- A. 0.05 mEq/L
- B. 0.5 mEq/L
- C. 0.25 mEq/L
- D. 5 mEq/L

Passage II

Carbohydrates are polyhydroxyaldehydes or polyhydroxyketones. However, in actuality, the carbonyl groups are often present as hemiacetals and acetals. Below are the structures of some carbohydrates.



143. The stereochemical relationship of compounds (3) and (4) is that they are

- I. diastereomers
- II. enantiomers
- III. epimers

- A. III only
- B. I and II
- C. I and III
- D. II and III

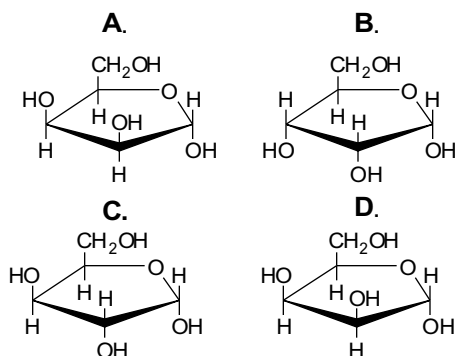
144. If the (-) enantiomer of each compound is oxidized by bromine water to yield the corresponding dicarboxylic acid, which will still be optically active?

- A. 2 and 3
- B. 3 and 4
- C. 1 and 2
- D. 1 and 4

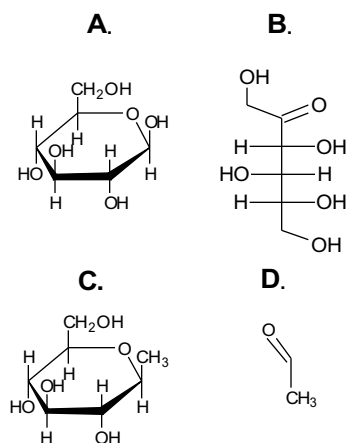
145. To convert these compounds to riboses (five-carbon sugars), one must

- A. cyclize the chain by forming a hemiacetal with the C-4 hydroxyl and the C-1 aldehyde.
- B. oxidize the C-1 aldehyde to a carboxylic acid.
- C. reduce the C-5 carboxylic acid to an alcohol.
- D. reduce the C-5 carboxylic acid to an aldehyde.

146. Referring to the previous question, when compound 1 is converted to a ribose, the cyclic hemiacetal it forms is



147. Which of the following compounds will give a negative Benedict's test?



Passage III

Single-gene defects may be autosomal or X-linked, and either dominant or recessive. A specialist in medical genetics encounters the following cases.

148. A family history is obtained from a person affected with a suspected genetic disease. It shows a pattern of inheritance in which:

- every affected person had at least one affected parent
- normal persons had normal offspring, who in turn also had normal offspring
- about the same number of males as females were affected.

What type of inheritance is this likely to be?

- Autosomal dominant
- Autosomal recessive
- X-linked dominant
- X-linked recessive

149. Another patient has a family history in which:

- nearly all affected persons were males
- all daughters of an affected male seemed to be carriers
- none of the sons of an affected male were affected

What type of inheritance is this likely to be?

- Autosomal dominant
- Autosomal recessive
- X-linked dominant
- X-linked recessive

150. Another patient has a family history in which:

- the disease was equally distributed among the male and female offspring of affected females
- all daughters of an affected male were affected
- none of the sons of an affected male and unaffected female were affected

What type of inheritance is this likely to be?

- Autosomal dominant
- Autosomal recessive
- X-linked dominant
- X-linked recessive

151. Another patient has a family history in which:

- carrier females transmit the trait to half of their sons
- none of the carrier females' daughters were affected, but half were carriers

What type of inheritance is this likely to be?

- Autosomal dominant
- Autosomal recessive
- X-linked dominant
- X-linked recessive

152. Another patient has a family history in which:

- males and females were equally affected
- two of the offspring from two unaffected parents were affected, while the other six offspring were unaffected.

What type of inheritance is this likely to be?

- Autosomal dominant
- Autosomal recessive
- X-linked dominant
- X-linked recessive

Questions 158 to 162 are independent of any passage.

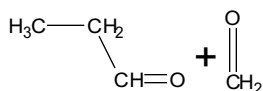
153. Which of the following RNA sequences would be transcribed if the sequence of the DNA coding strand were TATTGCATCAA?

- A. UAUUGCAUCAA
- B. AUAACGUAGUU
- C. TTGUTGCUUTU
- D. AUAAGCAUCAA

154. A sarcomere on an electron micrograph is the region between

- A. two Z lines.
- B. two H bands.
- C. two A bands.
- D. two I bands.

155. What is the main product of the following reaction?



- A.
- B.
- C.
- D.

156. In humans, essential fatty acids are required for the synthesis of

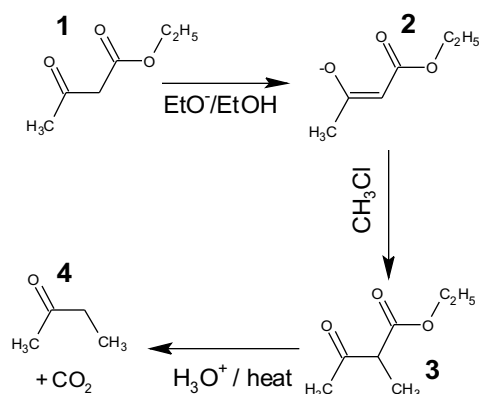
- A. estrogen.
- B. bile acids.
- C. purines.
- D. prostaglandins.

157. You have at your disposal benzene, bromine, nitric acid, and sulfuric acid. How would you produce m-bromonitrobenzene?

- A. m-bromonitrobenzene cannot be made with these materials.
- B. Brominate the benzene, then nitrate.
- C. Nitrate the benzene, then brominate.
- D. Do either B or C.

Passage IV

The following questions relate to the reaction sequence outlined below.



158. Compound 1 is a/an

- A. α -keto carboxylic acid.
- B. β -keto carboxylic acid.
- C. α -keto ester.
- D. β -keto ester.

159. The first step in the sequence could be enhanced by

- A. replacing the hydrogens at the alpha position by two alkyl groups.
- B. replacing one of the hydrogens at the alpha position by a chlorine atom.
- C. replacing one of the carbonyl groups with iodine atoms.
- D. using ethanoate/ethanoic acid instead of ethoxide/ethanol.

160. Although sodium methoxide is readily available, it was not used in the first step because

- A. it is not as strong a base as ethoxide.
- B. it would cause an undesired transesterification.
- C. it would be more difficult to hydrolyze a methyl ester than an ethyl ester.
- D. a hindered base is needed to protect the carbonyl group.

161. The second step is a type of reaction known as

- A. S_N1 .
- B. S_N2 .
- C. electrophilic addition.
- D. free radical substitution.

162. The third step involves

- I. protonation of O in the C=O of the ester group
- II. S_N2 substitution of OC_2H_5 by OH
- III. heat-induced decarboxylation

- A. I and II
- B. I and III
- C. II and III
- D. I, II, and III

163. What type of reaction does not occur in the sequence?

- A. Hydrolysis
- B. Acid-base
- C. Reduction
- D. Decarboxylation

Passage V

The kidneys adjust loss of water and electrolytes from the body to keep body fluids constant in amount and composition. They excrete wastes and foreign substances, secrete the hormones erythropoietin and renin, and activate vitamin D.

164. Which of the following substances are mostly reabsorbed in the proximal convoluted tubule?

- I. water
- II. glucose
- III. amino acids
- IV. urea

- A. I and II are correct.
- B. II and III are correct.
- C. I, II, and III are correct.
- D. All are correct.

165. Major determinants of plasma osmolarity include all of the following except

- A. sodium.
- B. hemoglobin.
- C. albumin.
- D. chloride.

166. The consumption of oxygen by the kidneys

- A. is greatest in the medulla.
- B. remains constant as blood flow increases.
- C. is regulated by antidiuretic hormone.
- D. is proportional to the level of sodium transport.

167. Glomerular filtration rate would be increased by

- A. a decrease in plasma oncotic pressure.
- B. a narrowing in the renal artery.
- C. disease resulting in fewer functioning glomeruli.
- D. an increase in plasma proteins.

168. Renin

- A. causes loss of sodium and water from plasma.
- B. is secreted by the cells of the proximal tubule.
- C. converts angiotensinogen to angiotensin I.
- D. converts angiotensin I to angiotensin II.

169. Which of the following is the least important in controlling the synthesis and secretion of aldosterone?

- A. ACTH.
- B. Angiotensin II.
- C. Plasma sodium concentration.
- D. Blood pressure.

170. The tubules (mainly proximal) of the nephron secrete ammonia into lumen to enhance the excretion of hydrogen ions. Ammonia is an effective urinary buffer because

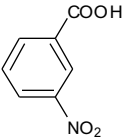
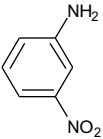
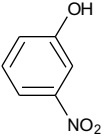
- I. its production can be increased if necessary
- II. it has a low pK_b (4.8)
- III. the walls of the tubules are impermeable to NH_4^+

- A. I and II are correct.
- B. I, II, and III are correct.
- C. II and III are correct.
- D. I and III are correct.

Passage VI

In various scientific pursuits, it is important to be able to purify substances so that they can be better studied or better used. Common methods of separating substances are extraction, recrystallization, distillation, and chromatography.

A mixture contains the three compounds shown in the table below.

	Solubility (g/100 mL)	
	in H ₂ O	in ether
1 	0.31	25.0
2 	0.11	5.5
3 	3.02	106

171. The mixture is dissolved in a small amount of ether. To this is added an equal volume of 0.01 M HCl_(aq). After shaking, two layers are formed: an aqueous layer and an ether layer. The layers are then separated. Which of the compounds will be found in the aqueous layer?

- A. 1 only
- B. 2 only
- C. 3 only
- D. 2 and 3

172. To the ether layer is added an equal volume of 0.01 M NaOH_(aq). Again, two layers are formed. After separating them, which of the compounds will be found in the aqueous layer?

- A. 1 only
- B. 3 only
- C. 1 and 3
- D. 2 and 3

173. This aqueous layer is evaporated to dryness leaving a solid residue of mass 0.31 g. Ten milliliters of aqueous acid of pH 3 are added. After stirring, the residue is smaller. What is the identity of the residue?

- A. 1 only
- B. 2 only
- C. 3 only
- D. 1 and 3

174. In extractions, the distribution constant is the ratio of the concentrations of a particular species between two solvents at equilibrium. If the distribution constant for an organic acid (HA) between chloroform and water is 100, i.e. $[HA]_{\text{CHCl}_3} / [HA]_{\text{H}_2\text{O}} = 100$, and the dissociation constant of the acid in water is 10^{-5} , increasing the pH of the aqueous phase from 4 to 10 will have what effect on the quantity of HA in the chloroform phase? (Assume HA does not dissociate or dimerize in the chloroform phase.)

- A. The quantity is reduced to less than half of what it was.
- B. The quantity is reduced but remains more than half of what it was.
- C. The quantity is increased but is not more than double what it was.
- D. The quantity is more than double what it was.

175. For a species that is distributed between an aqueous phase and an organic extraction phase, the quantity extracted by the organic phase is

- I. larger at higher temperatures if the solubility in both layers remains unchanged
 - II. larger if the total volume of the organic phase is used in portions rather than all at once
 - III. larger if the species is weakly basic and an acidic aqueous phase is used
- A. I is correct.
 - B. II is correct.
 - C. III is correct.
 - D. II and III are correct.

176. A mixture of toluene (methyl benzene) and aniline (amino benzene) is subjected to liquid column chromatography with alumina (Al₂O₃) as the solid phase. Which is most likely to occur?

- A. Toluene will be eluted first since it has a lower boiling point.
- B. Separation will not occur since the molecules are about the same size.
- C. Aniline will be eluted first since it is more polar than toluene.
- D. Toluene will be eluted first since it is less polar than aniline.

Passage VII

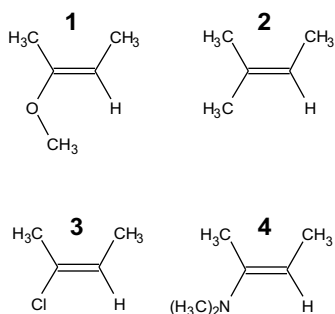
The theory of evolution maintains that all species came into existence by gradual and continuous changes from earlier forms. Evidence of the descent of separate species from a common ancestor can be found from various sources such as comparing anatomical structures, examining DNA, and studying the fossil record.

177. Current hypotheses concerning the Earth's primordial atmosphere indicate that there was little or no free
- oxygen.
 - hydrogen.
 - carbon dioxide.
 - nitrogen.
178. The best definition of an organism's fitness in the evolutionary sense is its
- probable genetic contribution to future generations.
 - ability to perform optimally in its environment.
 - chance of surviving to maturity.
 - reproductive health.
179. Which of the following conditions would not be susceptible to natural selection?
- A dominant allele in the homozygous condition
 - A dominant allele in the heterozygous condition
 - A recessive allele in the homozygous condition
 - A recessive allele in the heterozygous condition
180. Selection acts upon
- species.
 - populations.
 - genes.
 - individual phenotypes.
181. If selection acts to remove one extreme in a distribution of phenotypes, this is called
- genetic drift.
 - natural selection.
 - balancing selection.
 - directional selection.
182. Which of the following is not an assumption for Hardy-Weinberg equilibrium?
- Large population
 - No selection
 - Non-random mating
 - No mutations
183. Random fluctuations in gene frequencies in small populations is called
- mutagenic disequilibrium.
 - genetic drift.
 - selection.
 - heterogenesis.
184. Which of the following is not a distinguishing characteristic of a species?
- Sharing of a common gene pool
 - Reproductive isolation from all other groups
 - Ability to mate within the group
 - A genetically distinct group of natural populations
185. Which of the following is not a general characteristic of chordates?
- Vertebral column
 - Pharyngeal gill slits
 - Dorsal hollow nerve cord
 - Notochord
186. All of the following are homologous structures except
- the wing of a penguin and the foreleg of a turtle.
 - the wing of an insect and the wing of a bat.
 - the arm of a human and the foreleg of a dog.
 - The foreleg of a squirrel and the flipper of a seal.
- Questions 192 to 196 are independent of any passage.**
187. Removal of the adrenal glands would be expected to have all of the following consequences except
- poor mobilization and use of adipose tissue.
 - hyperglycemia.
 - excessive loss of sodium in the urine.
 - poor resistance to infection.
188. An infrared absorption spectrum is obtained from a compound known to have a hydroxyl group and a carbonyl group. Absorption due to hydroxyl group O-H bond stretching occurs at $3,620\text{ cm}^{-1}$. At what wavenumber would absorption due to C=O stretching likely occur at?
- $3,620\text{ cm}^{-1}$
 - $7,200\text{ cm}^{-1}$
 - $1,700\text{ cm}^{-1}$
 - $9,560\text{ cm}^{-1}$
189. Hyperglycemia can be induced by all of the following except
- thyroxine.
 - aldosterone.
 - ACTH.
 - glucagon.
190. A hospital has possibly switched the babies of Couples X and Y. Their blood types are as follows:
 Couple X – type A and type A
 Couple Y – type AB and type O
 Baby 1 – type O
 Baby 2 – type B.
 Which baby belongs to which couple?
- Both babies belong to Couple Y.
 - Baby 1 belongs to Couple Y and Baby 2 belongs to Couple X.
 - Baby 1 belongs to Couple X, but Baby 2 could belong to either couple.
 - Baby 1 belongs to Couple X and Baby 2 belongs to Couple Y.

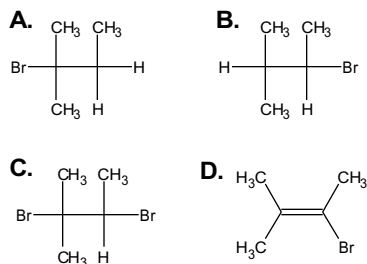
191. Cholesterol is a precursor in the biosynthesis of all of the following except
- aldosterone.
 - cortisol.
 - endorphins.
 - testosterone.

Passage VIII

Alkenes are characterized by C=C bonds. As such, they are subject to electrophilic addition reactions. Most electrophilic additions obey Markovnikov's rule; however, there are some exceptions. Examples of alkenes are shown below.

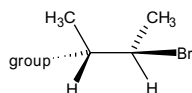


192. When HBr adds to compound 2 above, the main product is



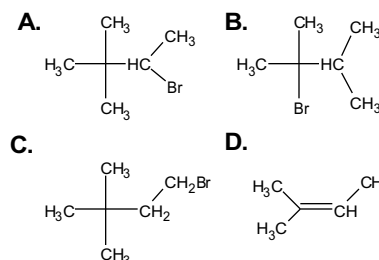
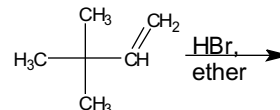
193. What is the order of reactivity of the compounds above to electrophilic addition of HBr?
- 1 > 2 > 3 > 4
 - 3 > 1 > 4 > 2
 - 4 > 1 > 2 > 3
 - 2 > 4 > 1 > 3

194. Which of the compounds is most likely to form an addition product with the general structure shown below?

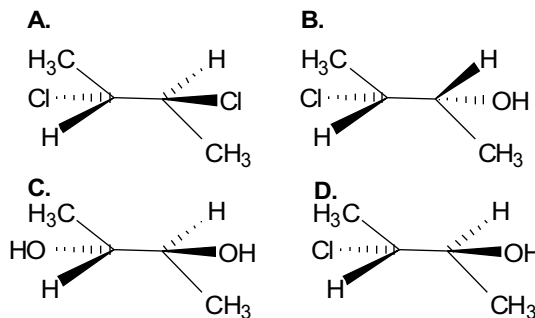
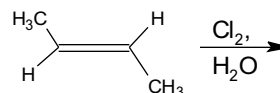


- Compound 1
- Compound 2
- Compound 3
- Compound 4

195. What is the major product of the following reaction?



196. What is the major product of the following reaction?



Passage IX

Since frog embryos are easily available and easy to work with, they are often used in studies of animal development.

After fertilization of a frog egg, the zygote divides many times forming a ball of cells called a morula. Gradually, this becomes hollow and the structure is called a blastula. During gastrulation, an area on the blastula, called the blastopore, invaginates. The cells of the dorsal lip of the blastopore migrate into the blastopore forming a three-layered gastrula. The three layers are the ectoderm, mesoderm, and endoderm. Following this is neurulation. A thick plate of cells forms a ridge along the ectoderm, which folds over itself forming a buried tube called the neural

tube. The embryo at this stage is called a neurula. Eventually, the end of the neural tube farthest away from the blastopore will form the brain.

197. When a frog gastrula is cut in half, the side containing the blastopore develops into a mature frog while the other side dies. The most plausible explanation is that
- cells lacking a distinct morphology are unimportant to development.
 - the blastopore is necessary to induce proper development.
 - the side that did not contain the blastopore failed to undergo any determination.
 - the side that did not contain the blastopore were destined to become the placenta.

198. When the dorsal lip of the blastopore is microsurgically transplanted into the blastocoele of another frog gastrula, a siamese twin tadpole (joined at the belly) sometimes results. This is because
- the transplanted dorsal lip induces a second gastrulation in addition to the first one.
 - the transplanted dorsal lip carries different genetic information.
 - the gastrula is very sensitive to disturbances; even agitation with a fine needle would produce the same result.
 - the transplanted dorsal lip causes dedifferentiation and redevelopment of the cells around it.

199. Referring to the previous question, the hypothesis that cells within the blastocoele induce the transplanted dorsal lip cells to dedifferentiate is
- supported by the data.
 - contradicted by the data.
 - neither supported nor contradicted by the data.
 - None of the above.

200. In the mature frog, the blastopore will have given rise to
- the anus.
 - the brain.
 - the mouth.
 - the liver.

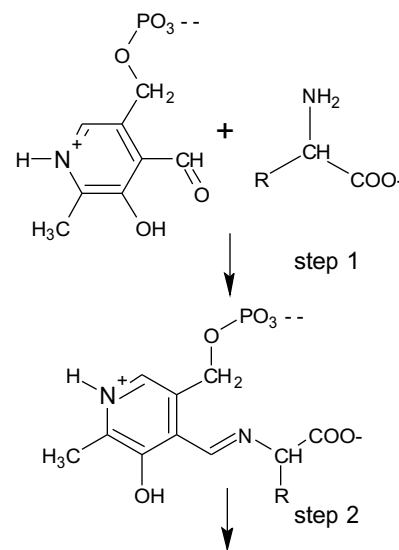
201. If the mesoderm of a gastrula were disrupted in some way, which organ would most likely be affected the most?
- The spinal cord.
 - The intestines.
 - The heart.
 - The skin.

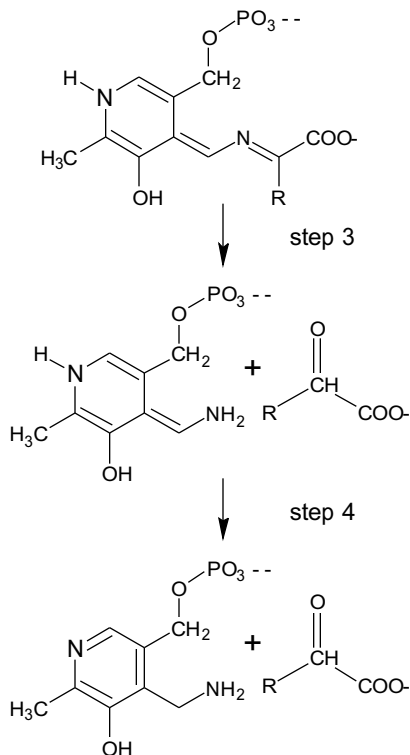
202. In the neurula, neural crest cells eventually become detached. In an experiment, these cells were injected with a dye and their migrations were followed. The dye was later found in cartilage, Schwann cells, adrenal glands, and sensory neurons. This indicates that
- neural crest cells are insensitive to induction.
 - neural crest cells are relatively undetermined when they leave the neural tube.
 - these four types of cells have the same basic function.
 - these four types of cells have the same basic structure.

Passage X

Reactions in living systems have basically the same mechanisms as those carried out in laboratories. To make reactions proceed more rapidly, enzymes take the place of heat and inorganic catalysts. Also, these enzymes allow only specific reactions to occur and not numerous other possible reactions.

An important metabolic pathway in the catabolism of proteins is the transamination of amino acids. Transaminations use pyridoxal phosphate, a derivative of vitamin B₆, as cofactor. Part of this pathway is shown below.





203. Which of the following is/are true?

- I. Pyridoxal phosphate has an aromatic ring.
- II. Pyridoxal phosphate has a net positive charge.
- III. Pyridoxal phosphate has an ester linkage.

- A. Only III is true.
- B. I and II are true.
- C. II and III are true.
- D. I and III are true.

204. Step 1 involves

- A. condensation.
- B. nucleophilic addition followed by elimination of water.
- C. decarboxylation.
- D. an aldol reaction.

205. Step 2 involves

- A. hydration.
- B. oxidation.
- C. decarboxylation.
- D. deprotonation of an acid followed by bond rearrangements.

206. Step 3 involves

- A. hydrolysis.
- B. oxidation.
- C. decarboxylation.
- D. hydration.

207. Step 4 involves

- A. condensation.
- B. tautomerization.
- C. phosphorylation.
- D. an aldol reaction.

208. The overall effect of this pathway is that

- A. An amino acid is oxidized to an β-keto acid.
- B. An amino acid is reduced to an β-keto acid.
- C. An amino acid is oxidized to an α-keto acid.
- D. An amino acid is reduced to an α-keto acid.

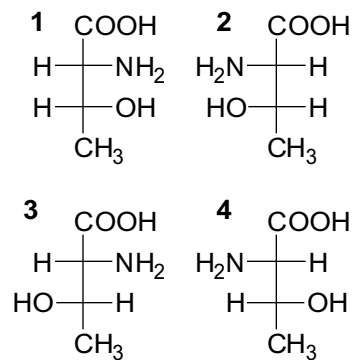
209. This pathway actually carries on for many more steps.

What is likely to occur further along the pathway?

- A. Pyridoxal phosphate is regenerated
- B. Oxidative phosphorylation
- C. Substrate-level phosphorylation
- D. Glycolysis

Questions 215 to 219 are independent of any passage.

210. Which of the following molecules are diastereomers?

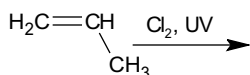


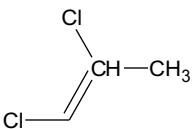
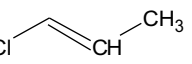
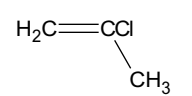
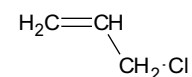
- A. 1 and 2; 3 and 4
- B. 1 and 3; 1 and 4; 2 and 3; 2 and 4
- C. 1 and 4; 2 and 3;
- D. 1 and 3; 1 and 4; 2 and 4

211. The diameter of an erythrocyte ("microscopist's ruler") is

- A. 7 nm
- B. 70 nm
- C. 7 μm
- D. 70 μm

212. A woman who is heterozygous for brown eyes (blue is recessive) and heterozygous for brown hair (blond is recessive) marries a man who has blond hair and is heterozygous for brown eyes. What is the probability they will have a son who has brown hair and brown eyes, and who is capable of fathering children with blue eyes?
- A. 1/4
B. 1/2
C. 1/8
D. 1/16
213. Physiologically-active thyroxine exists in which of the following forms?
- A. Bound to prealbumin
B. Bound to albumin
C. Bound to thyroxine-binding globulin
D. Unbound
214. What is the major product of the following reaction?



- A. 
- B. 
- C. 
- D. 

STOP. IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK. YOU MAY GO BACK TO ANY QUESTION IN THE BIOLOGICAL SCIENCES TEST BOOKLET.

END OF MCAT EXAM
