第 1 問から第 3 問では、問題文の中の [　　] 内の数字はマークシートの問番号を示している。該当する問番号の解答記入欄に答をマークしなさい。

第 1 問　次の問 1 ～ 6 の空所 [　1　] ～ [　6　] に入れるのに最も適当なものを (1) ～ (4) から 1 つ選び、その番号をマークしなさい。

問 1.　I made [　1　] to the classroom two minutes before the start of the class.

(1) forward　(2) it　(3) there　(4) up

問 2.　She has a talent for predicting trends, [　2　] her success in business.

(1) hence　(2) so　(3) then　(4) therefore

問 3.　Standard tickets are [　3　] to get a week before this concert.

(1) impossible　(2) likely　(3) potential　(4) questionable

問 4.　A: “Thank you for reminding me about the meeting.”
B: “[　4　].”

(1) Nothing　(2) Probably　(3) Sure　(4) Usually

問 5.　The company decided to [　5　] the research team $3,000,000.

(1) donate　(2) invest　(3) offer　(4) supply

問 6.　The orbit of the asteroid is entirely [　6　] that of the Earth.

(1) inner　(2) innermost　(3) inside　(4) interior

第 2 問　次の問 1 ～ 4 においては、それぞれ日本語の意味に合うように下の(1)～(7)の語句を並べかえて空所を補い、適当な文を完成させなさい。解答は [　7　] ～ [　14　] に入れるものの番号のみをマークしなさい。ただし文頭にくる文字も小文字にしてある。

問 1.　あなたが来年 800,000 ドルの特別賞を受賞するのは、今年中にあと 10 勝した場合だけだ。

You will _____ [　7　] _____ _____ _____ [　8　] _____ next year if you win another ten races by the end of this year.

(1) $800,000	(2) a	(3) awarded	(4) be
(5) of	(6) only	(7) special prize	

問 2.　幾らか注意深い人なら彼女の表情の微妙な変化に気づいただろう。

_____ [　9　] _____ _____ [　10　] _____ _____ noticed the subtle change in her facial expression.

(1) careful	(2) degree	(3) have	(4) people
(5) some	(6) to	(7) would	

問 3.　彼は娘を医者にしたいと願っていた。

He wished _____ _____ [　11　] _____ _____ [　12　] _____.

(1) a	(2) daughter	(3) doctor	(4) his
(5) make	(6) of	(7) to	

問 4.　私は彼がより安全な運転の練習をしているのを見ていた。

I was looking _____ _____ [　13　] _____ _____ _____ [　14　].

(1) at	(2) drive	(3) him	(4) how
(5) practicing	(6) safer	(7) to	

第 3 問　次の英文を読み、後の問いに答えなさい。

Tardigrades, also known as water bears, are probably the toughest creatures on Earth. The microscopic organisms can survive for decades completely frozen with no moisture and can survive high heat and pressure that would basically make any other living thing explode. And now, reports Daniel Oberhaus at *Wired*, it's possible that a colony of them are living on the moon.

The story of the tiny lunar bears began last April, when Israel Aerospace Industries' Beresheet probe and lunar lander—the first object sent to the moon by a private company—crashed into the moon's Sea of Serenity, a lunar plain created by an ancient volcanic eruption. Aboard the lander was a DVD-sized package, called a lunar library, that belonged to the Arch Mission Foundation, a nonprofit focused on creating "a backup of planet Earth." While the lander was destroyed, *Wired*'s Oberhaus reports a package aboard the craft is believed to have survived. Within it were thousands of little tardigrades stuck to the payload via special tape.

After consulting with technical advisors and viewing imagery of the crash site taken by NASA's Lunar Reconnaissance Orbiter, it appears the object was probably ejected from Beresheet and is sitting on its own, away from the crash site. American entrepreneur Nova Spivack, founder of Arch Mission, says the heat of the crash was not enough to melt the nickel disks of the library, which are encased in several layers to block cosmic radiation. "Ironically, our payload may be the only surviving thing from that mission," Spivack tells Oberhaus.

That payload contains much more than water bears. The purpose of the Arch Mission Foundation is to send repositories of human knowledge into strategic locations in space. If humans survive into the future, they can serve as time capsules of days gone by. If humans don't survive, they will stand as monuments to our species and will give any intelligent life that finds them access to our history, science and literature.

Surprisingly, a large amount of the human experience is crammed into the little library. The gadget is made up of 25 nickel disks. The first four include analog, nano-scale etchings of 60,000 pages worth of information readable using various microscopes. Those documents reveal how to access the digital information on the other 21 disks. Digitally embedded on those disks is all of the English Wikipedia, thousands of classic books, a linguistic key to 5,000 languages, and an Israeli time capsule that includes descriptions of its culture and history among other things.

Oberhaus reports that human DNA samples are also included in the library, sandwiched in layers of epoxy resin between the 40 micron nickel disks with hair and blood from 24 humans embedded as well. There are also bits of holy sites, including a sample from the Bodhi tree in India, in those layers. For good measure, tardigrades were stuck to tape that was attached to the library.

The question now is, are those tardigrades able to survive on the lunar surface? It's definitely possible. Brian Resnick at *Vox* reports that on Earth, tardigrades are able to enter a special state called cryptobiosis, which makes them almost indestructible. In this state they pull in their legs and expel almost all the moisture from their bodies. When they enter this type of hibernation they're called tuns, and they

were in that state when sent to the moon.

But there's more going on than just pulling in their legs. For starters, their metabolism decreases by 99.9 percent. Then they produce glycerol, which is essentially antifreeze, and also secrete a simple sugar that turns into the equivalent of a suit of armor. It's enough to survive in space, at least for a little while. In 2007, a European Space Agency satellite exposed tardigrades to cosmic radiation in open space for ten days. When they were returned to Earth and rehydrated, some of the microscopic water bears woke up.

Even if the Beresheet crash was more (　あ　) than believed, tardigrade expert Lukasz Kaczmarek at the Adam Mickiewicz University in Poznań, Poland tells Ian Sample at *The Guardian* the animals likely survived. "Tardigrades can survive pressures that are comparable to those created when asteroids strike Earth, so a small crash like this is nothing to them," he says.

But that does not mean future astronauts will find colonies of the little guys spreading across the moon. As tuns, the animals may live on for years. But they would quickly die if they came out of that special hibernation state. "They cannot colonize the moon because there is no atmosphere and no liquid water," Kaczmarek says. "But it could be possible to bring them back to Earth and then add the water. They should (　い　)."

Resnick reports that if astronauts ever investigate the Beresheet crash site and find the bear-filled library, it could help researchers answer some questions about life itself. In particular, if the little tardigrades can survive for extended periods on the moon, it might mean life can propagate throughout the universe, spreading via hardy microbes hitching a ride on comets and asteroids.

https://www.smithsonianmag.com/smart-news/crashed-spacecraft-might-have-put-water-bears-moon-180972840/ (改変あり)

注　tardigrade: クマムシ　lander: 着陸船　entrepreneur: 起業家
cosmic radiation: 宇宙線　repository: 保管庫　epoxy resin: エポキシ樹脂
Bodhi tree: 菩提樹　cryptobiosis: 代謝の停止状態　hibernation: 冬眠
antifreeze: 不凍性の　secrete: ～を分泌する　simple sugar: 単糖
metabolism: 代謝　rehydrate: ～に水を加えて元に戻す
propagate: 繁殖する　comet: 彗星

問 1.　Beresheet の衝突についての本文の記述内容と合致するものを (1) ～ (4) から 1 つ選び、その番号を [　15　] にマークしなさい。

(1) A lunar library and tardigrades do not appear to have been destroyed in the crash.
(2) A volcanic eruption on the moon caused Beresheet to crash but saved the payload.
(3) Technical advisors believe that no package aboard Beresheet survived the crash.
(4) The lunar library's contents appear to have helped the payload to survive the crash.

問 2. 空所 (　あ　) に入れるのに最も適切なものを (1) ～ (4) から 1 つ選び、その番号を [　16　] にマークしなさい。

(1) catastrophic　(2) frequent　(3) spontaneous　(4) unexpected

問 3. 空所 (　い　) に入れるのに最も適切なものを (1) ～ (4) から 1 つ選び、その番号を [　17　] にマークしなさい。

(1) die　(2) explode　(3) revive　(4) shrink

問 4. クマムシが“tun” になる過程で起こることについての本文の記述内容と合致しないものを (1) ～ (4) から 1 つ選び、その番号を [　18　] にマークしなさい。

(1) Their bodily processes needed to stay alive almost completely stop.
(2) They absorb as much moisture as possible into their bodies.
(3) They become almost completely unable to be destroyed.
(4) They use glycerol and a simple sugar to protect themselves.

問 5. クマムシについての本文の記述内容と合致するものを (1) ～ (4) から 1 つ選び、その番号を [　19　] にマークしなさい。

(1) Tardigrades are able to make any other living thing explode.
(2) Tardigrades are able to survive for a short amount of time in space and possibly longer.
(3) Tardigrades' bodies function similarly to humans and other mammals.
(4) Tardigrades can survive on the moon after coming out of hibernation.

問 6. 本文の記述内容と合致するものを(1)～(4)から 1 つ選び、その番号を [　20　] にマークしなさい。

(1) Scientists have finally been able to recover tardigrades from the Beresheet crash site on the moon.
(2) The Arch Mission Foundation sent a probe to the moon to find out if there are living things there.
(3) The lunar lander mission accidentally revealed that life forms like hardy microbes had propagated on the moon.
(4) The lunar library includes not only analog and digital data and biological materials but also samples of sacred objects.

この後の第 4 問と第 5 問は記述用解答用紙に解答しなさい。

第 4 問　乳濁液の新しい作製法についての次の英文を読み、後の問いに答えなさい。

この問題文は、著作権者の許可が得られた後に掲載します

（前頁からの続き）

この問題文は、著作権者の許可が得られた後に掲載します

http://news.mit.edu/2017/new-way-mix-oil-and-water-1108 (改変あり)

注　cliché: 決まり文句
condense: 凝結する
drug-delivery system: 薬物送達システム
emulsion: 乳濁液
precipitate: 凝結する
phase-change: 相転移
pharmaceutical: 医薬品
droplet: 小滴
sonicating: 超音波処理
dispersion: 分散
scalable: 大規模化が可能な
surfactant: 界面活性剤
coalesce: 合体する
reservoir: 容器
cloak: ～を覆う

問 1. 本文の内容に即し、次の問いに日本語で答えなさい。

(i) 下線部《A》により乳濁液ができるまでの過程を述べなさい。

(ii) 下線部《A》を特に医薬品や加工食品に応用した場合に得られる利点を述べなさい。

問 2. 下線部《B》のようにすることによって、

(i) 乳濁液にどのような望ましい効果が得られるか

また、

(ii) そのような効果が得られるのは何故か

それぞれ、本文の内容に即して日本語で答えなさい。

問 3. 乳濁液作製法に対する下線部《C》および《D》という呼び方は、各作製法のどのような特徴を捉えたものか、本文の内容に即して日本語で述べなさい。

問 4. 下線部《E》を和訳しなさい。

問 5. 次の段落は本文のどの位置に置くのが最も適切か、【あ】～【お】の記号で答えなさい。

In addition, Guha says, “we envision that you could use multiple liquids and make much more complex emulsions.” And besides being used in food and drugs, the method could have other applications, such as in the oil and gas industry, where fluids such as the drilling “muds” sent down wells are also emulsions, Varanasi says.

envision: 見込む　　emulsion: 乳濁液

第 5 問　次の英文を読み、下線部 (1) ～ (3) の日本語の内容を英語にしなさい。

The convenience store industry, which has grown through its traditional business model of operating 24 hours a day, seven days a week and selling goods at fixed prices, has reached a crossroads.

Under contracts, franchise stores are required to open 24 hours a day and the more these shops earn, the more profits convenience store companies gain. However, (1)そのような加盟店は労働力不足に悩まされており、営業を続けることがますます困難になってきている.

In a recent survey conducted by the Ministry of Economy, Trade and Industry on managers of convenience stores, approximately 60% of them admitted that they face labor shortages and about 40% said they are not satisfied with their franchise contracts.

Nonetheless, major convenience store companies are slow to reform their operations apparently because they do not want to change their existing business model that has supported the firms' high profits. If a growing number of stores discontinue their round-the-clock operations, the headquarters will gain less income and be forced to review their efficient distribution networks through which they deliver goods to stores from late at night to the predawn hours to prepare to serve a large number of customers in the morning.

Major convenience store firms claim that customers want their stores to operate 24 hours a day. However, consumer awareness has changed as a result of the government's policy of reforming the way people work. (2)民間企業による世論調査では、回答者の半数以上がコンビニの営業時間を短縮することに賛成している。

Convenience stores that accept utility fee payments, handle parcel deliveries and provide ATM services now make up infrastructure for people's lives. (3)もしフランチャイズ契約の下で営業するコンビニが存続できなくなれば、もはやそれが提供する利便性の恩恵を受けることはできなくなってしまう。The whole industry has come under pressure to swiftly change its business model so that it fits with the times.

https://mainichi.jp/english/articles/20190527/p2a/00m/0na/006000c (改変あり)