Examiners' Report Paper A 2019

The Examiners' report highlights the most common mistakes and explains which point deductions were made for these mistakes. Where more than the total marks available for a claim could be deducted, simply no marks were awarded for that claim. No negative marks were awarded nor were marks deducted from other claims.

Purpose and extent of the examiners' report

The purpose of the present examiners' report is to enable candidates to prepare for future examinations (cf. Article 6(6) of the Regulation on the European qualifying examination for professional representatives).

1. Outline

This paper concerns devices which are used for growing cells in laboratories.
In order to successfully grow cells in culture, i.e. in a laboratory, it is necessary to supply the cells with the essentials for growth and respiration. Cells derived from animals or humans are normally grown in a liquid medium which contains all the necessary nutrients. The cells are usually grown under controlled conditions including pH, temperature and exchange of gases with the surroundings, such as oxygen (O_2) and carbon dioxide (CO_2). In conventional cell culture containers the supply of oxygen comes from the empty space in the container above the surface of the cell culture medium, known as the head space.

The **client's letter** describes a number of **problems** with respect to containers for growing cells. The surface provided for gas exchange is limited and may result in low rates of cell growth. Further, there may be a sharp initial drop in pH within the first hour or two caused by carbon dioxide from the head space dissolving in the medium. This drop in pH can negatively affect the rate of cell growth.

The **invention** described overcomes these problems by providing a device for culturing cells comprising a first and a second gas permeable membrane on opposite sides of a frame. The term "gas permeable" means that the membranes contain pores that allow gases to pass through it. The use of a gas permeable membrane

enables an increased exchange of gases, in particular CO_2 and O_2. It is the aim of the invention to increase the exchange of gases and therefore to increase the cell growth rate.

Three **embodiments** are described.

The first embodiment relates to a cell culture chamber having two gas permeable membranes on opposite sides of a frame. The device also has at least one resealable aperture through the frame that allows substances to be introduced into or withdrawn from the culture chamber.

In the second embodiment, instead of an aperture in the frame at least one membrane is made resealable, to allow the device to be opened and resealed multiple times in order to introduce or withdraw substances from the culture chamber.

In the third embodiment the two alternative solutions are combined.

Therefore, the following solutions are possible to design a resealable opening: either the frame comprises at least one resealable aperture or at least one membrane is a resealable membrane or a combination of both.

Some features are described as being **essential features**. It is mentioned in par **[005]** that "*in order to prevent the cell culture medium from leaking out of the device it is essential that the gas-permeable membranes are liquid-impermeable. For the same reason the membranes must be attached to the frame of the device by means of a leak-proof seal.*"

It is further mentioned in **[011]** that "*using two membranes 2a, 2b and a frame 1 for forming the cell culture chamber has the drawback that the liquid medium and the cells cannot be introduced or withdrawn merely by opening the lid as described in D1. It is therefore essential that a leak proof resealable opening is present in the cell culture device*."

In the context of the second embodiment (resealable membrane) it is mentioned in **[017]** that "*it is essential that the adhesive is pressure-sensitive, so that when the leakproof resealable membrane is pressed back onto the frame it forms a leak-proof seal.*" This same point is repeated in **[019]**.

The **client's letter** describes two **prior art documents**, documents D1 and D2.

Document D1 describes a conventional cell culture container in the form of a multi-well plate. The plate consists of a flat, planar surface comprising a series of wells which hold the cell culture medium and cells.

In the third paragraph of D1 it is disclosed that "*a leak-proof resealable aperture may be designed in the lid or in the plate, allowing individual access to the single wells*. *Instead of a rigid lid a gas permeable membrane may be used. Such a membrane is available on the market under the product name GasEasy™.*"

Document D2 discloses the GasEasy™ sealing film, which is mentioned in D1. D2 further mentions that in the case of large multi-well plates, it is possible to use several films juxtaposed next to each other.

Neither D1 nor D2 discloses or suggests that two gas permeable and liquid impermeable membranes may be used on opposite sides of a frame to form a cell culture chamber between the two opposing membranes.

The major **challenge** of this paper was to detect this inventive concept and the need for a resealable opening somewhere in the device. Two alternative solutions are proposed for this requirement: an aperture in the frame, or to make at least one membrane resealable. In addition, both alternative solutions can be combined. It was a challenge to cover these solutions without excluding any embodiments.

A further challenge was to identify the essential features, which differed for each embodiment, and to draft the dependent claims such that the dependencies correspond to and are consistent with the two alternative solutions.

2. Expected Claims

2.1 Independent Claims

Candidates were expected to draft a claim to a cell culture device. This claim should solve the problem of increasing the surface provided for gas exchange and enhancing the rates of cell growth. Such a claim could have the following wording:

*A cell culture **device** comprising a frame (1) and at least two gas-permeable and liquid-impermeable membranes (2a, 2b) attached on opposite sides of the frame with a leak-proof sealing to form a cell culture chamber (4) between the opposing two membranes and the frame (1), wherein:*

a) the frame comprises at least one leak-proof resealable aperture (3a, 3b) and/or

b) at least one of the membranes (2a, 2b) is resealably attached to the frame (1) in a leak-proof manner using a pressure-sensitive adhesive.

Such a claim was rewarded with **42 marks.** Linking the options a) and b) by “and/or” covers all three embodiments and provides more options for formulating dependent claims.

In addition to the device claim a **method claim** related to the use of the device was expected. This claim should refer back to the device claim, because the method of culturing cells as such is known from D1 (**[004]**):

*A **method** of culturing cells in a device <u>according to any of the preceeding claims</u>, the method comprising:*

a) suspending the cells to be cultured in an appropriate amount of cell culture medium to form a cell suspension;

b) introducing the cell suspension into the cell culture device; and

c) incubating the cell culture device containing the cell suspension in conditions allowing cell growth.

This wording is almost literally disclosed in **[020]** of the description and in **[004]** of D1. Such a claim was rewarded with **8 marks.**

A **method claim related to manufacturing the device** was also expected, since the client mentions in **[015]** that methods of manufacturing the cell culture device could be commercially interesting:

*A **method** of manufacturing a device according to any of the preceeding claims, the method comprising attaching at least one of the membranes (2a, 2b) to the frame (1) in order to provide a leak-proof seal between the membrane and the frame.*

Such a claim was rewarded with **7 marks**.

2.2 Dependent claims

The following features could be claimed in the dependent claims (up to a **maximum of 27 marks**) with marks allocated depending on their usefulness as a fall-back position:

Device

- *the aperture (3a, 3b) comprises a gasket* **(3 marks)**
- *the gasket comprises an elastomeric material* **(3 marks)**
- *the elastomeric material comprises an antimicrobial agent* **(3 marks)**
- *the frame (1) comprises at least two resealable apertures (3a, 3b)* **(3 marks)**
- *the at least one aperture (3a, 3b) has a diameter of 1 to 2 mm* **(1 mark)**
- *at least one of the membranes (2a, 2b) is optically transparent.* **(2 marks)**
  (1 mark if both required to be transparent)
- *the membranes (2a, 2b) comprise polyethylene* **(1 mark)**
- *the membranes have a gas permeability performance at 10^5 Pa and at 37°C of from 1 x 10^{-16} to 3 x 10^{-16} m^3 / s Pa for O_2 and from 6 x 10^{-16} to 7 x 10^{-16} m^3 / s Pa for CO_2* **(1 mark)**
- *at least one membrane (2a, 2b) is coated with a substance that facilitates cell adhesion, such as gelatine, collagen or fibronectin* **(1 mark)**
- *the average distance between the membranes (2a, 2b) is from 1 to 5 mm* **(3 marks)**

Method of culturing cells

- *the cell culture chamber is filled completely with cell suspension such that the chamber does not contain air* **(3 marks)**
- *the device is held in a rack so there is sufficient space between each membrane and the incubator to allow air to circulate* **(3 marks)**

Method of manufacturing device

- *the membrane is secured to the frame by ultrasonic welding* **(3 marks)**

3. Alternative Solutions

Alternatively the independent device claim could have been formulated in the two-part claim format, for example, considering D1 as the closest prior art:
A cell culture ***device*** *comprising a frame (1) and a first gas permeable and liquid impermeable membrane (2a), attached to the frame (1) with a leak-proof sealing, wherein:*

a) *the frame comprises at least one leak-proof resealable aperture (3a, 3b) and/or*
b) *the membrane (2a) is resealably attached to the frame (1) using a pressure-sensitive adhesive,*

characterised in that *a second gas-permeable and liquid-impermeable membrane (2b) is attached to the opposite side of the frame (1) with a leak-proof sealing to form a cell culture chamber (4) between the opposing first and second membranes (2a, 2b) and the frame (1).*

The device claim could also be formulated as **two or three separate independent claims,** each relating to one of the three embodiments. Such a solution was awarded full marks, however fewer options remain for formulating the dependent claims.

Many candidates claimed a leak-proof resealable opening in general instead of the three specific embodiments. However, the client makes it clear in **[019]** that the three embodiments are the only ones possible for the device of the invention: ***"****Using two opposing membranes 2a, 2b and a frame 1 for forming the cell culture chamber 4*

allows only the three embodiments described above...”.. **7 marks** were deducted in such a case.

The claims should meet the requirements of Rule 43 (2) EPC. Therefore if two or more independent claims were filed for the same subject matter, only the claim attracting the least marks was assessed.

The claim to a method of culturing cells can alternatively be framed as a use claim and would still attract full marks. However, if the claim set contained more than one independent process or use claim directed to the method of culturing cells, only the worst of these claims was marked.

The dependent claim referring to a rack used to hold the device in an incubator can alternatively be presented as system or kit claim and would also be awarded the full **3 marks**.

4. Marking of the independent claims

The device claim was rewarded with **42 marks**. The claim to a method of culturing cells was worth **8 marks** and the method of manufacturing the device was worth **7 marks**

Device claim

4.1 Claims **lacking novelty** did not attract any marks. For example, a claim to a device with only one membrane lacks novelty over the disclosure of D1, which discloses a multi-well plate having a cell culture chamber and frame, a leak-proof resealable aperture in the plate, and a gas-permeable membrane.

4.2 Device claims that were **not inventive** lost **30 marks**. For example, a claim to a device that has only one membrane, where novelty is provided by an obvious or trivial feature, lacks an inventive step over D1. Furthermore, a claim that does not clearly convey that the cell culture chamber is formed between the two opposing

membranes is considered to lack an inventive step over the disclosure of D2 and the common general knowledge of the skilled person.

D2 **[004]** teaches that "*in the case of large multi-well plates, it is possible to use several films juxtaposed next to each other*". D2 does not explicitly disclose that a single chamber is formed by two membranes. However, it would be obvious to a skilled person that two membranes may be juxtaposed in such a manner that they each partly cover a single well, thereby forming a single chamber.

D2 also discloses that the membranes are attached to the frame with a leak-proof seal to form a cell culture chamber and that the membranes are resealably attached to the frame using a pressure-sensitive adhesive. Therefore, claims to a device having a cell culture chamber formed between two membranes and the frame do not clearly define the chamber as being formed between two opposing membranes and so would lack inventive step.

4.3 **Exclusion of embodiments** from the scope of the claim resulted in a deduction of **14 marks** for each excluded embodiment.

4.4 Each of the following missing **essential features** was penalised with a deduction of **10 marks** per feature: gas-permeable membrane, liquid-impermeable membrane, leak-proof sealing of membranes, leak-proof and resealable openings. If the claim referred to a resealable membrane without specifying the essential feature of a pressure-sensitive adhesive, this resulted in a deduction of **5 marks**. Claims to a device which were lacking any type of opening or cell culture chamber received a deduction of **30 marks**.

4.5 Any **unnecessary limitation** resulted in a deduction of **7 marks** per feature.

4.6 **Clarity** problems resulted in a deduction of up to **5 marks** for each clarity issue.

4.7 Missing **reference signs** in the independent device claim resulted in a deduction of **2 marks.**

4.8 If the independent device claim was not presented in the two-part form and where the prior art was not discussed in detail in the descriptionthere was a deduction of **2 marks.** Incorrectly formulated two-part form claims also received a deduction of **2 marks**.

Method of culturing cells

4.9 Claims **lacking novelty** did not attract any marks. For example, a method of culturing cells that does not refer to the device of the invention may lack novelty over D1.

4.10 Claims that were not inventive resulted in a deduction of **5 marks**. Moreover, a method that does not refer to the device of the invention, and uses another feature to establish novelty of the method, also received a deduction of **5 marks**.

4.11 Any unnecessary limitation resulted in a deduction of **5 marks** per feature (e.g. completely filling the cell culture chamber with medium).

4.12 Incorrect references to the device claims and clarity problems resulted in a deduction of **2 marks** for each issue.

Method of manufacturing device

4.13 Claims **lacking novelty** did not attract any marks. For example, a method that does not refer to the device of the invention and does not define a specific method of attaching the membrane to the frame, or includes any type of adhesive, lacks novelty over D2.

4.14 Claims that were **not inventive** resulted in a deduction of **5 marks**. For example, a method of manufacturing a device using a hot-melt adhesive or ultrasonic welding to attach at least one membrane to a frame, without reference to the device

of the invention, was considered not inventive. This claim does not solve the underlying technical problem of the invention.

4.15 Limitation of the claim to methods using an adhesive or ultrasonic welding did not result in any loss of marks. However, any additional unnecessary limitation resulted in a deduction of **3 marks** per feature.

4.16 Incorrect references to the device claims and clarity problems resulted in a deduction of **2 marks** for each issue.

5. Marking of the dependent claims

Overall **a maximum of 27 marks** could be gained for the dependent claims. It was the explicit wish of the client that no more than 15 claims are filed. Therefore, claims going beyond the 15th claim were disregarded for marking. The claim set was marked as a whole. Therefore, marks were deducted according to the following scheme:

- **2 marks** were deducted for each wrong dependency
- **2 marks** were deducted for each clarity issue

For missing reference signs in the dependent claims no marks were deducted.

If the device claim referred only to a leak-proof resealable opening, then a further **2 marks** were available for a dependent claim to a leak-proof resealable aperture in the frame and another **2 marks** could be gained for a dependent claim to a leak-proof resealable membrane with a pressure-sensitive adhesive.

A single dependent claim including multiple features only attracted one set of the allocated marks, as this was considered an attempt to circumvent the limit of 15 total claims. Similarly, optional features in the claims did not attract any marks.

6. Marking of the description

Candidates were also expected to draft the introductory part of a description according to Rule 23(4) IPRE. For the description a total of **16 marks** are available.

5 marks were available for describing the two **prior art** documents. A detailed description of the prior art was expected. In case a candidate used the two-part form correctly a shorter description of the prior art serving as basis for the preamble was allowed.

3 marks were available for defining the **problem**. In view of D1 and D2 the objective problem can be defined as increasing the gas exchange of a cell culture container in order to improve the rate of cell growth.

3 marks were available for making the client's letter into a **description** (technical field and general introduction) which provides support for the claims.

Finally, **5 marks** were available for **formulating the solution to the above-mentioned problem**. The candidates were expected to discuss the inventive concept of providing two opposing membranes that define a cell culture chamber and therefore increase the surface area available for gas exchange. The candidate should also discuss the two alternative solutions for the resealable opening.

ANNEX

Example set of claims

1. A cell culture **device** comprising a frame (1) and at least two gas-permeable and liquid-impermeable membranes (2a, 2b) attached on opposite sides of the frame (1) with a leak-proof sealing to form a cell culture chamber (4) between the opposing two membranes and the frame (1), wherein:

a) the frame (1) comprises at least one leak-proof resealable aperture (3a, 3b) and/or

b) at least one of the membranes (2a, 2b) is resealably attached to the frame (1) in a leak-proof manner using a pressure-sensitive adhesive.

OR (in two-part form)

1. A cell culture **device** comprising a frame (1) and a first gas permeable and liquid impermeable membrane (2a), attached to the frame (1) with a leak-proof sealing, wherein:

a) the frame (1) comprises at least one leak-proof resealable aperture (3a, 3b) and/or

b) the membrane (2a) is resealably attached to the frame (1) using a pressure-sensitive adhesive,

characterised in that a second gas-permeable and liquid-impermeable membrane (2b) is attached to the opposite side of the frame (1) with a leak-proof sealing to form a cell culture chamber (4) between the opposing first and second membranes (2a, 2b) and the frame (1).

2. The cell culture device according to claim 1, wherein the aperture (3a, 3b) comprises a gasket.

3. The cell culture device according to claim 2, wherein the gasket comprises an elastomeric material.

4. The cell culture device according to claim 3, wherein the elastomeric material comprises an antimicrobial agent.

5. The cell culture device according to any preceding claim, wherein the frame (1) comprises at least two leak-proof resealable apertures (3a, 3b).

6. The cell culture device according to any preceding claim, wherein the at least one aperture (3a, 3b) has a diameter of 1 to 2 mm.

7. The cell culture device according to any preceding claim, wherein at least one of the membranes (2a, 2b) is optically transparent.

8. The cell culture device according to any preceding claim, wherein the membranes have at 10^5 Pa and at 37°C a gas permeability performance of from 1×10^{-16} to 3×10^{-16} $m^3/(s \cdot Pa)$ for O_2 and from 6×10^{-16} to 7×10^{-16} $m^3/(s \cdot Pa)$ for CO_2.

9. The cell culture device according to any preceding claim, wherein the inner surface of at least one membrane (2a, 2b) is coated with a substance that facilitates cell adhesion.

10. The cell culture device according to any preceding claim, wherein the average distance between the membranes (2a, 2b) is from 1 to 5 mm.

11. A **method** of culturing cells in a device according to any of claims 1-10, the method comprising:
(a) suspending cells to be cultured in an appropriate amount of cell culture medium to form a cell suspension;
(b) introducing the cell suspension into the cell culture device; and
(c) incubating the cell culture device containing the cell suspension in conditions allowing cell growth.

12. A method according to claim 11, wherein the cell culture chamber is completely filled with cell suspension such that the chamber does not contain air.

13. A method according to claim 11 or 12, wherein the device is held in a rack during incubation in a manner that allows the first and second membranes to have direct contact with air.

14. A method of manufacturing a device according to any of claims 1-10, the method comprising attaching at least one of the membranes (2a, 2b) to the frame (1) in order to provide a leak-proof seal between the membrane and the frame.

15. A method according to claim 14, wherein the membrane is attached to the frame by ultrasonic welding.

Example sets of claims in German and French can be found on the following pages.

Beispiel eines Anspruchssatzes

1. Zellkultur**vorrichtung**, umfassend:
   - einen Rahmen (1) und
   - mindestens zwei gasdurchlässige und flüssigkeitsundurchlässige Membranen (2a, 2b), die jeweils mit einer auslaufsicheren Abdichtung an gegenüberliegenden Seiten des Rahmens (1) so befestigt sind, dass eine Zellkulturkammer (4) zwischen den beiden gegenüberliegenden Membranen und dem Rahmen (1) gebildet wird, wobei
     a) der Rahmen (1) mindestens eine dicht wiederverschließbare Aussparung (3a, 3b) umfasst und/oder
     b) mindestens eine der Membranen (2a, 2b) unter Verwendung eines druckempfindlichen Klebstoffs dicht wiederverschließbar am Rahmen (1) befestigt ist.

ODER (zweiteilige Form)

1. Zellkultur**vorrichtung**, umfassend:
   - einen Rahmen (1), und
   - eine erste gasdurchlässige und flüssigkeitsundurchlässige Membran (2a), die mit einer auslaufsicheren Abdichtung am Rahmen (1) befestigt ist, wobei
     a) der Rahmen (1) mindestens eine dicht wiederverschließbare Aussparung (3a, 3b) umfasst und/oder
     b) die Membran (2a) unter Verwendung eines druckempfindlichen Klebstoffs dicht wiederverschließbar am Rahmen (1) befestigt ist,

   dadurch gekennzeichnet, dass eine zweite gasdurchlässige und flüssigkeitsundurchlässige Membran (2b) mit einer auslaufsicheren Abdichtung an der gegenüberliegenden Seite des Rahmens (1) so befestigt ist, dass eine Zellkulturkammer (4) zwischen den beiden gegenüberliegenden Membranen (2a, 2b) und dem Rahmen (1) gebildet wird.

2. Zellkulturvorrichtung nach Anspruch 1, wobei die Aussparung (3a, 3b) eine Dichtung umfasst.

3. Zellkulturvorrichtung nach Anspruch 2, wobei die Dichtung ein elastomeres Material umfasst.

4. Zellkulturvorrichtung nach Anspruch 3, wobei das elastomere Material einen antimikrobiellen Wirkstoff umfasst.

5. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei der Rahmen (1) mindestens zwei dicht wiederverschließbare Aussparungen (3a, 3b) umfasst.

6. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei die mindestens eine Aussparung (3a, 3b) einen Durchmesser von 1 bis 2 mm hat.

7. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei mindestens eine Membran (2a, 2b) optisch transparent ist.

8. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei die Membranen bei 10^5 Pa und 37 °C eine Gasdurchlässigkeitsrate von 1×10^{-16} bis 3×10^{-16} $m^3/(s \cdot Pa)$ für O_2 und von 6×10^{-16} bis 7×10^{-16} $m^3/(s \cdot Pa)$ für CO_2 aufweisen.

9. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei mindestens eine Membran (2a, 2b) mit einem Stoff beschichtet ist, der die Zelladhäsion erleichtert.

10. Zellkulturvorrichtung nach einem der vorstehenden Ansprüche, wobei der durchschnittliche Abstand zwischen den Membranen (2a, 2b) 1 bis 5 mm beträgt.

11. **Verfahren** zur Zellkultivierung in einer Vorrichtung nach einem der Ansprüche 1 - 10, wobei das Verfahren Folgendes umfasst:

a) Suspendieren der zu kultivierenden Zellen in einer angemessenen Menge eines Zellkulturmediums zur Bildung einer Zellsuspension,

b) Einbringen der Zellsuspension in die Zellkulturvorrichtung,

c) Inkubieren der Zellkulturvorrichtung, die die Zellsuspension enthält, unter Bedingungen, die Zellwachstum ermöglichen.
[kann alternativ als Verwendungsanspruch formuliert werden]

12. Verfahren nach Anspruch 12, wobei die Zellkulturkammer komplett mit Zellsuspension gefüllt ist, sodass die Kammer keine Luft enthält.

13. Verfahren nach Anspruch 11 oder 12, wobei die Vorrichtung während der Inkubation z. B. von einem Gestell so gehalten wird, dass die erste und die zweite Membran direkten Luftkontakt haben.

14. **Verfahren** zur Herstellung einer Vorrichtung nach einem der Ansprüche 1 - 10, wobei das Verfahren die Befestigung mindestens einer der Membranen (2a, 2b) am Rahmen (1) umfasst, um eine Befestigung am Rahmen (1) mit einer auslaufsicheren Abdichtung bereitzustellen.

15. Verfahren nach Anspruch 14, wobei die Membran mit Ultraschall-Schweißen an dem Rahmen (1) befestigt wird.

Example de jeu de revendications

1. **Dispositif** de culture cellulaire comprenant :
   - un cadre (1) et
   - au moins deux membranes perméables aux gaz et imperméables aux liquides (2a, 2b) qui sont attachées sur des faces opposées du cadre (1) par une fermeture étanche afin de former une chambre de culture cellulaire (4) entre les deux membranes opposées et le cadre (1), dans lequel
   a) le cadre (1) comprend au moins un orifice refermable de façon étanche (3a, 3b) et/ou
   b) l'une des membranes (2a, 2b) est attachée au cadre (1) de manière refermable de façon étanche, à l'aide d'un adhésif sensible à la pression.

OU (avec la formulation en deux parties)

1. **Dispositif** de culture cellulaire comprenant :
   - un cadre (1)
   - une première membrane perméable aux gaz et imperméable aux liquides (2a), attachée au cadre (1) par une fermeture étanche ; dans lequel
   a) le cadre (1) comprend au moins un orifice refermable de façon étanche (3a, 3b) et/ou
   b) l'une des membranes (2a, 2b) est attachée au cadre (1) de manière refermable de façon étanche, à l'aide d'un adhésif sensible à la pression,

   caractérisé en ce qu'une seconde membrane perméable aux gaz et imperméable aux liquides (2b) est attachée sur la face opposé du cadre (1) par une fermeture étanche afin de former une chambre de culture cellulaire (4) entre les membranes opposées (2a, 2b) et le cadre (1).

2. Dispositif de culture cellulaire selon la revendication 1, dans lequel l'orifice (3a, 3b) comprend un joint.

3. Dispositif de culture cellulaire selon la revendication 2, dans lequel le joint comprend un matériau élastomère.

4. Dispositif de culture cellulaire selon la revendication 3, dans lequel le matériau élastomère comprend un agent antimicrobien.

5. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel le cadre (1) comprend au moins deux orifices refermables de façon étanche (3a, 3b).

6. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel l'orifice ou les orifices (3a, 3b) ont un diamètre de 1 à 2 mm.

7. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel au moins une des membranes (2a, 2b) est transparente optiquement.

8. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel les membranes ont une performance de perméabilité aux gaz, à 10^5 Pa et à 37°C, comprise entre 1 x 10^{-16} et 3 x 10^{-16} $m^3/(s \cdot Pa)$ pour l'O_2 et entre 6 x 10^{-16} et 7 x 10^{-16} $m^3/(s \cdot Pa)$ pour le CO_2.

9. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel au moins une membrane (2a, 2b) est revêtue d'une substance qui facilite l'adhésion cellulaire.

10. Dispositif de culture cellulaire selon l'une des revendications ci-dessus, dans lequel la distance moyenne entre les membranes (2a, 2b) est comprise entre 1 et 5 mm.

11. **Procédé** de culture cellulaire dans un dispositif selon l'une des revendications 1 à 10, le procédé comprenant :

a) suspendre des cellules à cultiver dans une quantité appropriée de milieu de culture cellulaire afin de former une suspension ;

b) introduire la suspension cellulaire dans le dispositif de culture cellulaire ;

c) incuber le dispositif de culture cellulaire contenant la suspension cellulaire, dans des conditions permettant la croissance cellulaire. [peut également être formulée comme une revendication d'utilisation]

12. Procédé selon la revendication 11, dans lequel la chambre de culture cellulaire est entièrement remplie de suspension cellulaire, de sorte que la chambre ne contient pas d'air.

13. Procédé selon les revendications 12 ou 13, dans lequel le dispositif est maintenu durant l'incubation, par exemple à l'aide d'un rack, d'une manière qui permet aux première et seconde membranes d'être en contact direct avec l'air.

14. **Procédé** de fabrication d'un dispositif selon l'une des revendications 1 à 10, le procédé comprenant la fixation d’au moins une des membranes (2a, 2b) au cadre (1), afin d'obtenir un attachement au cadre (1) par une fermeture étanche.

15. Procédé selon la revendication 14, dans lequel la membrane est fixée au cadre (1) par soudage ultrasonique.

Examination Committee I: Paper A - Marking Details - Candidate No

Category		Max. possible	Marks Marker 1	Marker 2
Claims	Independent product claim	42		
Claims	Independent method claim	15		
Claims	Dependent claims	27		
Description	Description	16		
Total				