Patent Examination Board

FD2 Drafting of Specifications
FINAL Mark Scheme 2023

Introduction and Description

Title [*½ mark for a title + ½ mark for title to reflect accurately what is claimed*]	**1 mark**
Statement of field (technical field of invention)	**1 mark**
Prior Art: Including [1] mark for pulling out prior art features not in the introductory paragraphs of the question paper (e.g., that known photo-reactor bags made from polyurethane plastic) rather than just copying/rewording the introductory paragraphs of the question paper.	**2 marks**
Statements of invention and general description: Generally, an express statement of what the feature of each claim *does* [*½ mark*] and corresponding *advantage* [*½ mark*] is rewarded in line with the feature groupings in the claims section below.	**20 marks**
Figures: i) Page numbering on figure pages [1/2] ii) Feature numbering on figures [1/2] iii) Figure description – prior art figures need to be clearly described as such [2]	**3 marks**
Specific description: Explanation of how the invention works conceptually [8], with a description of variants and alternatives [5]. Candidates should describe structure, function and operation.	**13 marks**

TOTAL: 40 marks

Claims

Independent apparatus claim	**24 marks**
Dependent apparatus claims	**23 marks**
Kit claims	**2 marks**
Independent Method claim	**3 marks**
Dependent Method claims	**3 marks**

TOTAL: 55 marks

Abstract

Title	**1/2 mark**
Figure	**1/2 mark**
Text - must state: technical field or main use [1], description of main features of the device and/or method [21/2], consistent use of reference numerals [1/2] (*ensure content is consistent with claims, but not just a copy thereof*)	**4 marks**

TOTAL: 5 marks

Grand Total = 100 marks

***Suggested* Independent apparatus claim:**

Possible claim wording	**Notes**
1. Apparatus for growing algae [2], comprising;	*Should mention the purpose of growing algae. N.B. could call the entire apparatus a photo-reactor bag, but then need to take care when defining features that are not part of the bag per se (such as floats).*
a photo-reactor bag for containing a mixture [/liquid] {comprising water, nutrients and algae}, [3]	*A (flexible) bag that is suitable for holding a liquid or a mixture of water/algae/nutrients etc (noting the bag contents should not be claimed).*
the photo-reactor bag having at least one transparent [upper] surface/portion for allowing light to reach the mixture [3], and	*The bag must be transparent (at least in part) so that light can reach the algae contained in the bag. (This might be implied by the "photo-reactor bag" term– look at claim and context). In this context "upper" seems a reasonable term to use. May state transparent to visible light.*
one or more buoyancy elements that enable the photo-reactor bag to float [on the sea] [4],	*An element that means the bag will float on water / the sea (can be provided as rib that is part of the bag or as separate float that is attached to the bag). Reference to a buoyant bag is also acceptable, so long as it doesn't exclude using floats attached to the bag. Need to convey the concept of floating at or near the surface [of the sea] so that light can reach the mixture.*
wherein the photo-reactor bag comprises a [/at least one] semi-permeable membrane [2] that retains algae within the bag whilst also allowing the selective exchange of substances between the photo-reactor bag and the sea [/saltier water on which the bag floats]. [4]	*This key feature needs to define how the bag has a semi-permeable membrane that retains the algae within the bag, but selectively allows certain other substances to pass through the membrane (i.e., in or out of the bag). Need to ensure the definition is broad enough to cover both the nutrient permeable membrane and the forward osmosis membrane. A general functional statement is preferred, but a feature that uses alternatives (e.g., that nutrients can pass into the bag or that water can pass out of the bag) would be acceptable.*

[plus up to [6 marks] for overall claim breadth, clarity, conciseness and not including unnecessary language or features] **24 marks**

The following examples of mark caps and restrictions apply if unnecessary limitations are included in the claim:

Catastrophic (0 marks)

- The claim is not novel over the prior art mentioned in question paper.
- Does not cover both types of semi-permeable membrane.
- Does not cover the buoyancy elements being floats and/or inflatable ribs.

- Includes other limiting, clearly separate/non-essential elements (e.g., the seawater/algae/wastewater/outfall pipe etc.)
- The claim only covers the apparatus “in use”.

Max 10 marks

- No mention (explicitly or inherently) of buoyancy either in claim 1 or introduced via a dependent claim (not clear if/how it would work if it didn’t float)
- Limited to producing algae for biofuel (could be used to grow other types of algae).
- Limited to requiring the membrane to be on the bottom of the bag.

Deduct 5 marks each:

- Includes unnecessary features (e.g., that should be present in the dependent claims), unless these do not unduly limit the claim (e.g., basic inlet).

Dependent apparatus claims

Marks are halved where dependencies are incorrect.

a)	**FO membrane embodiment – [4 marks**]
a.1	The semi-permeable membrane [1] comprises a forward osmosis (FO) membrane (that permits water to exit the bag but retains algae and nutrients inside the bag). [1]
a.2	The photo-reactor bag comprises an inlet for connection to a pipe/hose [1] supplying a continuous flow of wastewater. [1]
b)	**Nutrient permeable membrane embodiment [4 marks**]
b.1	The semi-permeable membrane comprises a nutrient permeable membrane [1] that permits nutrients to enter the bag but retains algae and water inside the bag [2].
b.2	The nutrient permeable membrane comprises a nitrate permeable membrane [1].
c)	**Photo-reactor bag structural features [10 marks]**
c.1	The photo-reactor bag is made from impermeable plastic/material with <u>one or more</u> patches of semi-permeable membrane. [1]
c.2	• The photo-reactor bag comprises a plurality of patches of semi-permeable membrane. [1]
c.3	○ The photo-reactor bag comprises one or more reinforcement strips attached to the impermeable plastic between the patches. [1]
c.4	• The photo-reactor bag comprises only a single patch/region of semi-permeable membrane. [1]
c.5	The semi-permeable membrane is provided at least on the lower (bottom) surface of the photo-reactor bag. [1]
c.6	

c.7	The semi-permeable membrane is provided at least on the <u>top</u> of the photo-reactor bag and is substantially transparent [to allow daylight to enter the bag through it].[1]
c.8	The photo-reactor bag has a thickness that allows penetration of daylight through substantially all of a mixture contained in the bag [/ is no more than 30cm thick]. [1]
c.9	The width of the photo-reactor bag is at least twice its depth [to prevent twisting] [No marks for specific dimensions, as rather limiting/arbitrary] [1]
c.10	The bag includes a port for connection to a hose [for pumping out the bag]. [1] The bag includes one or more attachment points/means (loops) for attachment to a buoy [to anchor the bag in place.] [1]
d)	**Buoyancy-related features [5 marks**]
d.1	The buoyancy elements are inflatable (ribs) and form part of [/are integrated with] the photo-reactor bag [1].
d.2	The buoyancy elements comprise at least one (foam) float attached to the photo-reactor bag. [1]
d.3	The buoyancy elements are configured so the photo-reactor bag floats on the surface of the sea [water]. (i.e., the top surface of the bag is out of contact with sea, the bottom surface in contact with the sea water). [1]
d.4	The buoyancy elements are configured so the photo-reactor bag floats 5-10cm below the surface of the sea (so top surface of bag is also in contact with the sea). [1]
d.5	• The top/uppermost surface of photo-reactor bag includes the semi-permeable membrane. [1]
e)	**Kit [2 marks]** A kit comprising the apparatus as defined in the claims above and at least one of a container of algae (for biofuel), a buoy, [foam] float, and a rope etc for attachment to the apparatus.

Suggested Independent Method claim [3 marks]

M1. A method of growing algae using the apparatus of claim 1 (or reciting the features of the apparatus longhand) comprising the steps of (i) putting algae in bag and (ii) placing the apparatus in the sea.

[NB: The apparatus claim likely to provide the best protection. However, the inclusion of method claims that recite the way the apparatus is used are considered to have value. Consider scope of protection provided by method claim and ensure any non-essential features aren't included.]

Dependent Method claims [3 marks]

Marks are halved where dependencies are incorrect.

f.1	The method further comprising the step of connecting the bag to a flow of wastewater - dependent on apparatus claims (a). [1]
f.2	Wherein step (ii) comprises placing in a region of sea [with high levels of nutrients] - dependent on apparatus claims (b). [1]
f.3	The method further comprising the step of pumping out the bag to extract algae [1]

For all dependent apparatus claims and all method claims, TOTAL = 31 marks

The [20 marks] for the statement of invention may be distributed as follows:

Independent apparatus claim – expanding/explaining each claim feature and supporting/explaining generalisations, explaining advantages etc [up to 4]

Dependent apparatus claims

a) FO membrane embodiment [up to 2]

b) Nutrient permeable membrane embodiment [up to 2]

c) Photo-reactor bag structural features (focussing on the different semi-permeable membrane configurations) [up to 5]

d) Buoyancy features (how/why buoyancy provided) [up to 3]

Method claims – expanding/explaining uses of apparatus and advantages etc [up to 3]

Kit claim – Anything beyond mere mention of a kit [up to 1]

For all claims:

- Consider whether the preamble is correct and whether the claim is in a sensible place in the dependent claims when awarding mark.
- No marks are awarded for trivial claims.
- No or reduced marks should be awarded for claims features written in terms of a method save the method claims themselves.

{ENDS}