HJ

Ţ ˥ ˎ ˆ غ يج يج Ḡ ‰

HJ 1069-2019

ˎ

Water quality Í Determination of the acute toxicity

Í Zebrafish (*Danio rerio*) eggs method

Ŕ ˆ Є

ˌ Ü Â ˅ Ţ يج ₮ ₮ ‰ ˌ ‰ Â

2019-12-31 ˆ 2020-06-30

ˆ

╠ ..... Ѝ
1 1
2 1
3 1
4 2
5 2
6 2
7 3
8 4
9 5
10 7
11 7
12 8
13 8
14 8
A 9
B 10
C 11
D 12
E 15
F 16
G 18

╥

ч ê Ţ ˥˩ ˜ غ يج Ḡ Ì غ ê Ţ ˥˩ ˜ غ يج Ì˘ Ḡ

˘ Ḡ ˥˩ r ã̃ ˘ ˧˩ ˘ L ‰Â

‰ ʊ ض à ضЙ̧ à غ ʒ Ţ ˧˩ Â

‰ A˙ G ч Â

‰ ч ǖ Â

‰ ˜ à ѣ ‰˜ L Â

‰ ˧˩ β' Ţ à Ţ يج ‰ѣ T

يج Â

‰ ˧˩ β' Ţ يج № Ţ à Ţ يج à

˧˩˛ à Ţ à ' ʒ ' ᵒᵒ ج ‰

غ يج ⇔ Ḡ `E˜ Â

‰ 2019 12 31 ‰Â

‰ 2020 6 30 Â

‰ Â

ᴧ

1 ᵩ

‰ ᴗ ᴧ Â

‰ ɢ ضر ȁ ضر Ӣ ȁ غ ʒ Â

2 ᴌ

‰ ṗ ᴗ Ӣ ↓ ᴅ Ţ Â 4 Ѣ ᴅ˘ ï ɢ

‰ Â

GB/T 6920 pH ṿ

GB/T 13267 ˆ ˜

HJ 91.1

HJ 506 .

HJ/T 91 ضر غ

HJ/T 164 ضر Ӣ

3 م Ɱ

Ӣ ↓ غ Ӈ ɢ ‰ Â

3.1

ᴧ fish egg

ɢ ᴧ ╟ ɑ ǖ ᴧ ˘ ᴧ ˜ ǖ ǟ A Â

3.2

Ṗ dilution level

ᴧ ᴧ U r № ṕ ˘ w̄ D Â ᴅ ˘ ˘ ↕

Ȍ D=1’ ǖ 250 ml 1000 mlˆ ᴧ r № ч 25%˜ ˘ ↕ Ȍ D=4 Â

3.3

u Ṗ lowest ineffective dilution

Ţ Ѣ ᵒᵒ ᴠ Ȍ ˘ ‰ Ѣ ɢ 90% ᴧ ᴠ

Ȍ ˘ LID Â

3.4

ᴧ EC50

48 h U ą 50% ᴧ ᵒᵒ ᴧ ᴧ U r № ˘ EC50

Â ‰ Ţ EC50 ᴧ ᴧ LC50 Â

3.5

ї̈ reference substance

Ţ˘ ɢ ˘ ‰ Ţ 3,4-ҩ Â

4 ʌ

ą Ī ˘ ضي à غ ∟ ð Ӣ˘ 4-

˙ 128- ї̀ ˧ ɢ Ь □ Ȍ Ţ˘ ضي 26 Ņ ¤ 1 Ņ ð Ӣ Ī 48

h˘ ˧ Ь ` LID EC_{50} ṿ˘ Â

5 م

∞ ˘ ˆ ˆ 7.11˜ ɾ Ī ˆ 7.8˜

Ţ ₽ ₮ ₩ U ˈP ˘ ᾧ ˧ ' U˘ ˘ ↕

ˆ 7.11˜ ʌ ج˘ ʌ r Â

6 ⊣ م

6. 1 ǜ

6.1.1

ą ã à à ȁ˚˚ ˧ ї̈ ї̀ ممم ƀ ч ɢ˚˚ ˧ Â

r 3.5 cm ˘ ˘ ضي 6 ˙ 24 ӈ Â ã ˘ Â ã r

ممم ḱ ˘ ˘ r ᾧ Â ضي˚˚ ˧ ╟ 6 ɑ Ь ʒ ą к v Â

Ī ї̈ ї́ r ð B Â

6.1.2 ˧

Ḡ ˧ ї̀ ů 70%˘ ɢ 4- ˙ 128- ˆ A˘ Â

6.2 ⊣

з ˘ № ą ˛ ج ‰ № ╕ Â ą ∟ ˘

˘ pH ṿ 6.5˙ 8.5˘ ˎ 1 0 ε S / c m Â

6.2. 1 ˛ ˆ NaOH˘ Â

6.2. 2 ˛ ˆ $CaCl_2 2H_2O$˘ Â

6.2. 3 ˆ $MgSO_4 7H_2O$˘ Â

6.2. 4 ($NaHCO_3$) Â

6. 2. 5 ˛ ˆ KCl˘ Â

6.2. 6 3,4-ҩ ˆ $C_6H_5Cl_2N$˘ ˘ п Â

6.2.7 ' ɟ ˆ HCl˘ =1.19 g/ml Â

6.2.8 ' ĉ HCl˜ =0.1 mol/L Â

ŭ 8.3 ml ˆ 6.2.7˜ ˘ 1 000 ml Â

6.2.9 . ' ĉ NaOH˜ =0.1 mol/L Â

ŭ 4 g . ˆ 6.2.1˜ ˘ ɢ Ţ˘ 1 000 ml Â

6.2. 10 ă 3,4-ĥ Ŭ ' ɟˆ $C_6H_5Cl_2N$˜ =100 mg/L Â

ŭ 0.05 g 3,4-ĥ ˆ 6.2.6˜ ˘ ɢ ‰ ˆ 6.2.16˜ Ţ˘ ‰ ˆ 6.2.16˜ 500 mĭ 24 h˘ pH ẏ 7.0 Â ѽ ' Ḡ ˘ Ŭ ˆ Ŭ 6 ɷ Â

6.2. 11 ă 3,4-ĥ ƀ ' ɟˆ $C_6H_5Cl_2N$˜ =3.7 mg/L Â

ŭ 3.7 ml ă 3,4-ĥ Ŭ ˆ 6.2.10˜ ˘ ė ẏ ‰ ˆ 6.2.16˜ 100 mĭ ą ╠ 8.2.1 26 Ņ ¤ 1 Ņ Â ƀ ч ˘ χ ╠ Â

6.2. 12 . Ŭ ' ɟˆ $CaCl_2·2H_2O$˜ =11.76 g/L Â

ŭ 11.76 g . ˆ 6.2.2˜ ˘ ɢ Ţ˘ 1 000 ml Âˆ Ŭ 6 ɷ Â

6.2. 13 Ŭ ' ɟˆ $MgSO_4·7H_2O$˜ =4.93 g/L Â

ŭ 4.93 g ˆ 6.2.3˜ ˘ ɢ Ţ˘ 1 000 ml Âˆ Ŭ 6 ɷ Â

6.2. 14 Ŭ ' ɟˆ $NaHCO_3$˜ =2.52 g/L Â

ŭ 2.52 g ˆ 6.2.4˜ ˘ ɢ Ţ˘ 1 000 ml Âˆ Ŭ 6 ɷ Â

6.2. 15 . Ŭ ' ɟˆ KCl˜ =0.22 g/L Â

ŭ 0.22 g . ˆ 6.2.5˜ ˘ ɢ Ţ˘ 1 000 ml Âˆ Ŭ 6 ɷ Â

6.2. 16 ‰ ɾ

. Ŭ ˆ 6.2.12˜ à Ŭ ˆ 6.2.13˜ à Ŭ ˆ 6.2.14˜ ġ . Ŭ ˆ 6.2.15˜ ضه Ŭ ʯ 25 ml ˘ 1 000 ml Â

7 ᴀ ل م

7.1 ' ' 2 Ņ · 8 Ņ’

7.2 pH ' ﻍ 0 · 14˘ № ч 0.1 pH ᛋ β’

7.3 Л' ﻍ 0 mg/L · 20 mg/L˘ № ч 0.1 mg/L’

7.4 ṕ ɾ ' Ồ ч 30×’

7.5 — ' ' 2 Ņ · 8 Ņ’ ' " Ů-18 Ņ’

7.6 Ī ' ˆ 26 Ņ ¤ 1 Ņ’

7.7 Ī ' ´ ⌈ à Ŭ à ᴸ à ᴸ ĭ ’

7.8 Ī ' 2.5 ml · 5 ml ì ⍰ ẘ Ī ˘ ˆ ڤ’

7.9 ᵒᵒ ᓀ ' ˘ ' 20 cm ¦ 10 cm ¦ 11 cmˆ ă C˜ ˘ ˆ ڤ’

7.10 ' 0 Ņ · 50 Ņ’

7.11 ' 5 mĭ ₀ ɢ 3 mm’

7.12 ₩ ᓚ ġ Â

8 ﻫ

8.1 ﻫ م Ḧ

ج ī ą 1 000 ml ī ɣ̣ ̣ ̣ ̣ ̣ ̂ ʒ ȁ ضم Ə ȁ Ə ح˜ HJ 91.1 ȁ HJ/T 91 HJ/T 164 ˘ ṗ ṕ ˜˘ ь ь Â

U˘ ⅄ ɢ 2 Ṇ˙ 8 Ṇ ǫ̈ غ Ḡ ˘ ˘ Ḡ ь 48 h Â Ḡ ˘ ‡ ̣ ̣ ̣ ̣ U ﻫ ' "ˆ Ů -18 Ṇ˜ Ḡ ˘ Ḡ ╟ ˜Ḥ№ ˜ U 1000 ml ح 500 ml˙ 700 ml № ˘ Ḡ ь 2 ɑ Â

8.2 ﻫ

8.2.1

' " Ḡ ضي ь 25 Ṇ "˘ ضي 2 Ṇ˙ 8 Ṇ ' " Â ī ضي ╟˘ ɢ Ī ˆ 7.6˜ Ţ˘ 26 Ṇ ¤ 1 Ṇ ǫ̈ U ɢ Â

8.2.2 pH ẅ

GB/T 6920 pH ṿ Â pH ṿ、 6.5 pH ṿ¸ 8.5 ˘ ą ˆ 6.2.8˜ ˛ ˆ 6.2.9˜ pH ṿ 6.5˙ 8.5˜ ⁞ ˘ ɣ ⁞ ʒ̈ Â U pH ṿ˘ U Â pH ṿ ʒ̈ ī ضي Ţ pH ṿ Ψ ī́ ˛ ī ˘ ‡ ь pH ṿ Â ˘ ʒ̈˜ pH ṿ ╟ U □ Â

8.2. 3

HJ 506 ˘ Ḡ ɢ ˆ 9.3˜ Ţ ɑ Ţ Δ ь ʏ ɢ 4 mg/L̂ 50% غ ˜ Â ˜Ḥ ˘ ь غ ṿ Â

8.3 ﻫ

8.3.1

ɣ ᵀ ˘ ɣ ч 10 3 ɑ ˘ ѿ ɣ 5 ⅃ 9.3˙ 9.6 № ˘ ɣ ⅃ ` 100%˙ 0% ь مخ Â

8.3.2 LID

ч Ḡ Ȍ ⅃ ů 90% ȁ ʏ Ȍ ⅃ ˜ ˛

90%˘ w̄ 4 ɷ˙ 5 ɷˆ ˧ ƀ ˜ 2 ɷ˙ 3 ɷ˜ Ồ ˘ ǟ 1 Â

1

Ồ D	⁄ ⁄ U r № ˆ %˜		ˆ ml˜		
			‰	r	r
1	100.0	1 Ồ ˆ ˧ ⁄ ˜	0	⁄ 200	200
2	50.0	2 Ồ	100	⁄ 100	200
3	33.0	3 Ồ	140	⁄ 70	210
4	25.0	4 Ồ	100	2 Ồ 100	200
6	16.7	6 Ồ	100	3 Ồ 100	200
8	12.5	8 Ồ	100	4 Ồ 100	200
12	8.3	12 Ồ	100	6 Ồ 100	200
16	6.2	16 Ồ	100	8 Ồ 100	200
24	4.2	24 Ồ	100	12 Ồ 100	200
32	3.1	32 Ồ	100	16 Ồ 100	200
é	é	é	é	é	é

8.3.3 EG50

ч Ḡ ` ч 100% ƀ ӊ ˘ ` ч 0% ƀ ӊ ˘ w̄ w̄ ˆ w̄ Ů 2˜ 5 ɷ Â

ɣ,̇ ɢ ج ‰ ˘ ╟ 8.2.1 26 Ņ ¤ 1 Ņ

⌠ غ ṿ Â

9

9.1

╟ w̄ ồ ˆ 6.1.1˜ ˘ ⌠ U ˚˚ ˧ ˆ 7.9˜ ṗ ˜ ˘ ˜ ˘ ɤ ˜ 2/3 ‰ ˆ 6.2.16˜ ˘ ǔ r ǐ ầ ǖ ầ ẫ ˘ ضي ˘ ӊ ɷ Ţ №≢ ɤ ˜ 1 غ 2 ˘ ;̇,̇ ˘ ɢ Ī ˆ 7.6˜ Ţ ω̣ Â

ɣ,̇ 3 Â

9.2 ˏ ˧ ǔ ˧ √

ω̣ U˘ ˚˚ ˧ ˆ 7.9˜ ˘ ǔ ṗ ˘ ˊ ṗ U ʿP ﻋ ṗ ˘ ṗ ɤ ˜ ‰ ˆ 6.2.16˜ ˘ ɣ ṗ 2 ɷ r ч ˘ ω̣̃ ʜ Â ˘ ˊ ˚˚ ˧˘ 30 min U ˇ ˚˚ ˧ ’ ˘ №≢ ˚˚ ˧ ˇ ṗ ˧˘ ‰ ˆ 6.2.16˜ ǁ Ţ˘ ضي Ī ˆ 7.6˜

Ţ 45 min Ů ϒ ˘ ʊ ѵ ϒ ѽ ˘ ϖ Ţ ů̆ ↰ 20
D.1 ≠ ǐ ↰˘ ѽ̃ ʜ ↰ Â ˚˚ ↰ ǐ ˘
ů̆ ǐ ů 70% 3 ↰ ₎₎ Â

9.3

└ ƀ □ E ѵ Ī ˆ 7.8˜˘
2 ml Â

⁘ Ⱬ ů̆ 60 ml˙ 70 ml ɢ ƀ □ Ī Ţ˘ ˆ 7.11˜ ضِ ↰ Ţ
Ⱬ ů̆ ѭ à à 20 ѵ ⁘ Ī Ţ˘ Ⱬ Ī ضِ ṕ r
ˆ 7.4˜ Ѝ ѡ ˘ ů̆ 4- · 128- ˆ ă̈ A˜ ǐ ↰˘ ˇ ضِ
№ ˆ ƀ à ѭ ↰ ˜ ↰ ʜ ↰ Âضِ ѵ ˜
Ī ˆ 7.8˜ Ţ Ⱬ ѵ ˜ 1 ǐ ↰˘ ⁘ Â
ϓ⁘ ƀ ضِ ↰ˆ 9.2˜ 45 min Ů 60 min ṗ Â
⁘ Ī ˆ 7.8˜ ɢ Ī ˆ 7.6˜ Ţ˘ B ɣ ѽ
ƀ 48 h Â

9. 4 ↓ ≡

ϒ ↰ o à r à № ǐ ч ˘ ∞ Ѝ ă̈ D.2˜'
a˜ ↰ o
o ↰ Ѝ ṗ Ƈ ŋ ƀ ˘ ض Âضِ Ѝ o ↰ Ƚ ƀ
ǐ Â
b˜ r
↰ ↰ ѭ ʊ Ţ Ů ˘ r ч r Â
c˜ №
ǖ ↰˘ ѱ d ˘ ƀ ↰ ѭ № Â ˘ ↕ № Â
48 h Ů № ƀ 24 h ǐ. ˘ □ Ӡ ∞ ч № Â
d˜
↰ β ɢ ↰ ѭ ƀ ˘ ٧ ᑐ ⌟ ˘ ˘ ↕
Â
⁘ Ī ˆ 7.8˜ ɢ ṕ r ˆ 7.4˜ Ѝ
2 ↰ Â
↰ 24 h ɇ 48 h Ů ₣ ĸ ѿ ’ ↕ ∞ ↰ ` ˘ ѿ
↰ ɇ ` Â

2 ᄂᆡ

		ᄂᆡ o	r	№	
	24 h	+	+	+	-
	48 h	+	+	+	+
' ñ + ò ȁ ∞ ˘ ñ-ò Â					

9.5

˘ E ĭ̈ 9 Â

a˜

ɣ ‰ ˆ 6.2.16˜ ᄂᆡ Â

b˜

ɣ ‰ ˆ 6.2.16˜ ᄂᆡ Â

c˜

ɣ 3,4-ᄒᆞ ƀ ˆ 6.2.11˜ ᄂᆡ Â

ɣ̣̈ ̣̈ 9 ᄎᆞᆫ ą ‰ ˆ 6.2.16˜ ɢ ˆ 9.1˜ ȁ̊ ̊ ᄂᆡ ĭ̈ ᄂᆡ Δ ˆ 9.2˜ ȁ

ɛ̇ ˆ 9.5˜ ˘ 8.2.1 26 Ṇ ±1 Ṇ˘

ʃ ɛ̇ ṿ 80% Â └ضي 26 Ṇ ˘̊ ˘ Ī

ˆ 7.6˜ └ضي 26 Ṇ ¤ 1 Ṇ Â

10 ᄒᆞ

ᄂᆡ ضي 90% ĭ̈ ɣ̣̈ ̣̈ ɣ Ȍ ˘ ᄂᆡ ᄂᆡ ɣ Ȍ LID ÂLID

ᄂᆡ ˘ LID=2 Â

EC50˜ G ˘ Ȝ̈˜ ᄂᆡ β ȁ ṗ ì ɾ Â

Ḡ U 1 β Â

11 ɻ ᄒᆞ

11.1 ŭ̈

Ɛ ˆ 6.2.16 ‰ ˜ ᄋᆞ 6 ' : ɢ 90%˙ 100% Â

Ɛ ˆ 6.2.11 ᾰ̈ 3,4-ᄒᆞ ƀ ˜ ᄋᆞ 6

' ` : ɢ 40%˙ 60% Â

11.2

Ɛ №≢ ˆ 6.2.16 ‰ ˜ ȁ ɟ =1.3 mg/L ȁ ɟ =3.7 mg/L ȁ ɟ =6.3 mg/L ɣ ȁ Ţ ȁ ̂̂̂ ɑ ˆ ᾰ̈ 3,4-ᄒᆞ └˜ ᄋᆞ

ч ˘ ɷ ڜ 6 ' ╠ ч ṗ ‰ Ẓ №≠
ч 0.0%˙ 5.8% à 4.5%˙ 8.5% à 9.7%˙ 18.1%˜ ‰ Ẓ №≠ ч 1.8% à 3.5% à
13.6%˜ ч 12.9% à 15.5% à 17.1%˜ ʹP ч 12.7% à 16.8% à 23.4%’ U ч
` ṗ ‰ Ẓ ч 0.0%˙ 5.3%˜ ‰ Ẓ ч 1.5%˜ ч
10.6%˜ ʹP ч 10.6% Â

ʹE №≠ ˆ ڜ ʌ ˘ LID=2˜ à ʒ ˆ Ƈ .
ĭ ˘ LID=4˜ ϑ ч ˘ ɷ ڜ 6 '
ɇ ʒ ڜ G ʏ Ồ LID ˘ ч ṗ
‰ Ẓ №≠ ч 5.3%˙ 5.5% à 5.3%˙ 5.8%˜ ‰ Ẓ №≠ ч 1.9% à 1.4%˜
ч 14.5% à 14.8%˜ ʹP ч 14.2% à 14.0% Â

ʹE ő 3,4-ʜ ˆ EC_{50}=3.1 mg/L˜ ϑ ч
EC_{50} ˘ ɷ Ỵ 6 ' ṗ ‰ Ẓ ч 2.9%˙ 12.7%˜
‰ Ẓ ч 7.3%˜ ʹP ч 0.9 mg/L˜ ч 1.2 mg/L Â

12 Ӈ ɱ ┼

12.1

Ī 48 h U˘ ч Ь ` ˘ ϒ ↕ Ī
Â

12.2 ɱ

ɇ ⁚ Ӈ ↓ ˘ ч Â ϒ ↕˘ ʌ ڜ U
Â

a˜
Ī 48 h U˘ ч ů 90%’

b˜
Ī 48 h U˘ ч ` ˛ 10% Â

13 Ц

ᵽ ´ ᵖ Ь G ɣ Ӈ ₃ ɷ Ӈ '

a˜ ҷ O à à à Ḡ ĭ Ḡ ’
b˜ ╠ ҷ pH ṿ à ĭ ╠ ’
c˜ ᵭ˘ ‰ ˘ à ’ ’
d˜ à ɇ ϒ ⁚ L ’
e˜ ᵽ Â

14

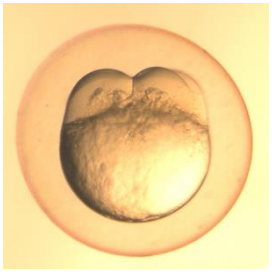
ч ˜— ⁚ ˆ — ᵣ Ь G 50%˜ Ţ 30 min ɣ
U ѿ Â ĺ à Ƈ 3,4-ʜ ч Â

A

Ѓ Є

ꓘ Ĩ Ĩ

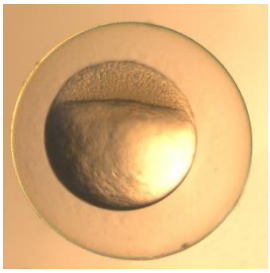
U 1-



ꓘ 4-

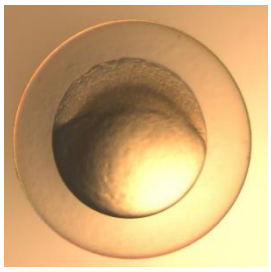
ꓘ 8-

خه 128-



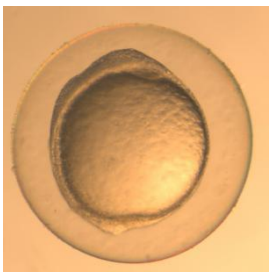
خه

خه



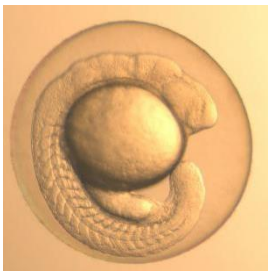
ʌ 30% ˜

ʌ 75% ˜



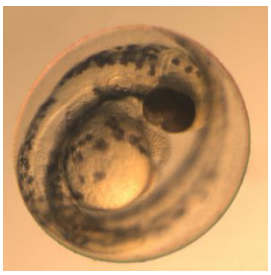
ʌ

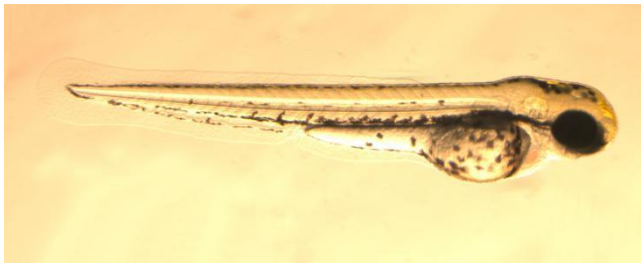
φ 6 φ



φ 18 φ

ʌ





.

B

Ѓ Є

ŭ ŭ̈

˜ U Ī 1 Ա˙ 2 Ա Â └ Ī ȁ ȁ ȁ ѿ ȁ

ȁ ɐ γ Ḡ ȁ˚˚ ˧˘ γ Ӥ ч Ī ī̈ ɐˆ ˜

ǟ GB/T 13267˜ Â

B.1

ą ‰ ˆ 6.2.16˜ ɢ Ī ī̈ Â ȁ ȁ

˝ ⌈ . ˆ ᵖ ȁĭ ˜˘ NaCl 300 µS/cm˙ 500 µS/cm

U ƀ ч Ī Ӟ ˜ ɢ Ī ī̈ Â

B.2

Ţ Ѣ Ƈ φ ˘ غ Ḡ ضي 80%˜ pH ṿ : ɢ 6.5˙ 8.5 Â

B.3

26 Ṇ ¤ 1 Ṇ Â

B.4 Ѡ̣

16 h /8 h ȁ 14 h/10 h 12 h /12 h ѿ/ Ա ˘ ˜ Â ѿ 540

lux ˘ Â

B.5

Ḡ 1 g/L˙ 1.5 g/L ˗ Â

B.6

γ ڤ γ ˧ ч ˘ ج ي . ˧ U ˗ Â

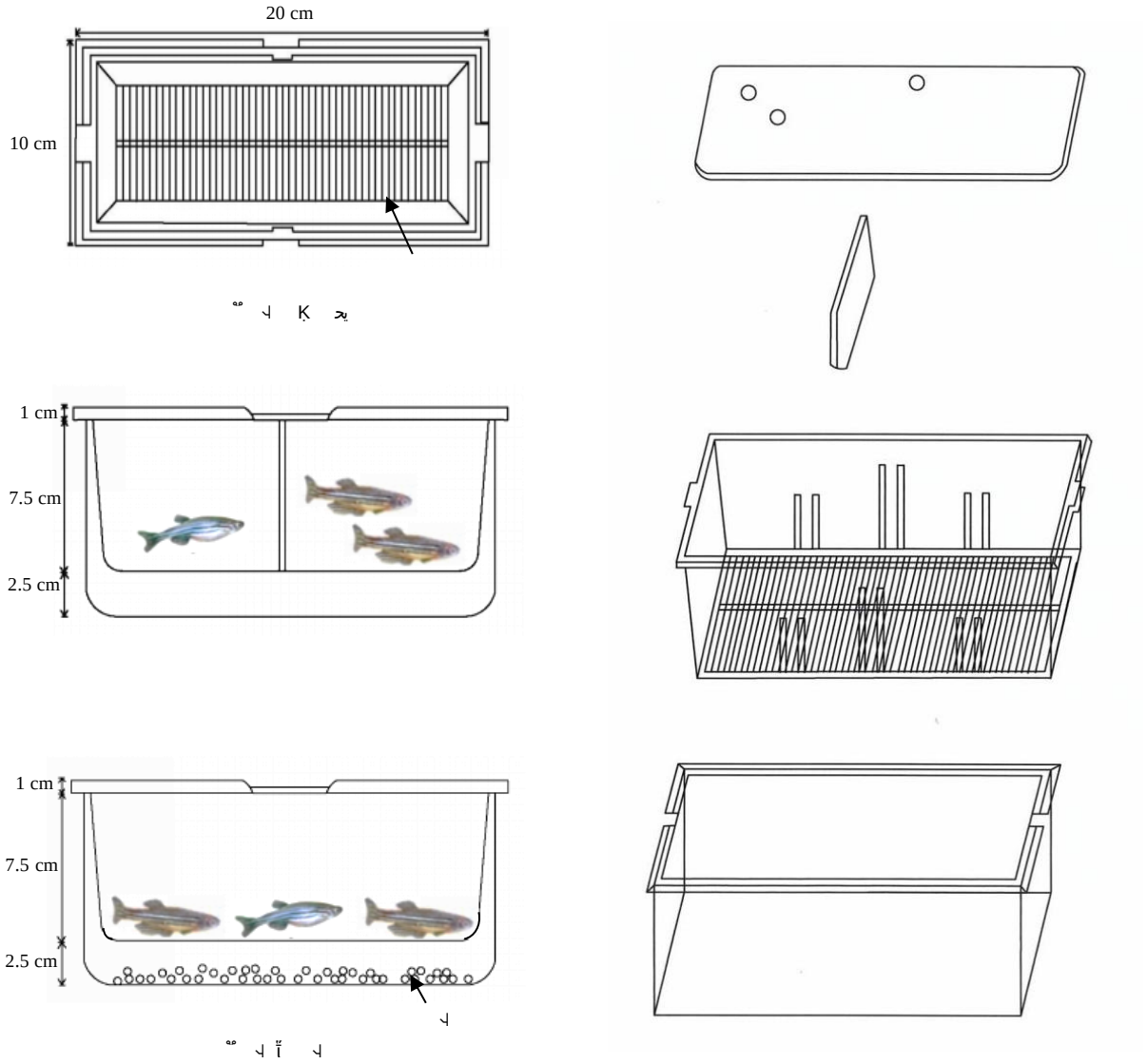
B.7 ˏ ˧ ⁄...

ˆˆˆ ɑ ˜ ⌈ ˘ 6 ˙ 24 ˘ ˚˚ ˧ U №

Ī 1.5 Ա˙ 2 Ա ˚˚ ˧ Â ч Ḡ ˧ ŭ˘ Â

C

Ѓ Є



C.1

D

Ѓ Є

ꙋ ⌋

D.1 ꙋ ⌋ ї ꙑ

D.1.1 ǔ ꙋ ⌋

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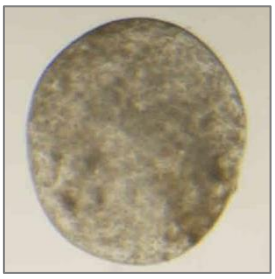

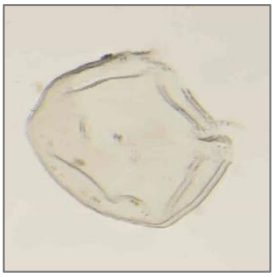

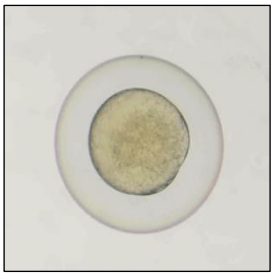

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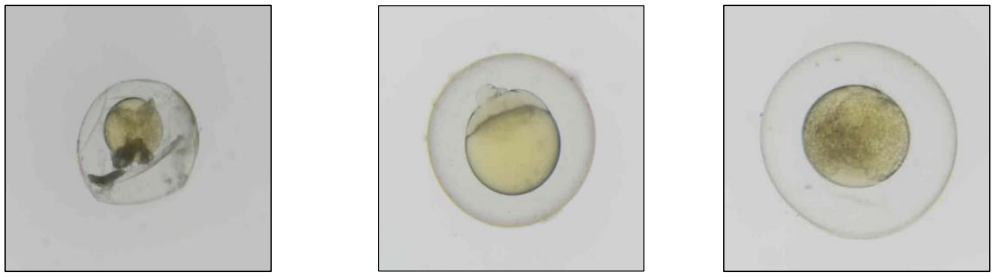

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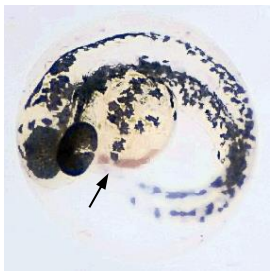

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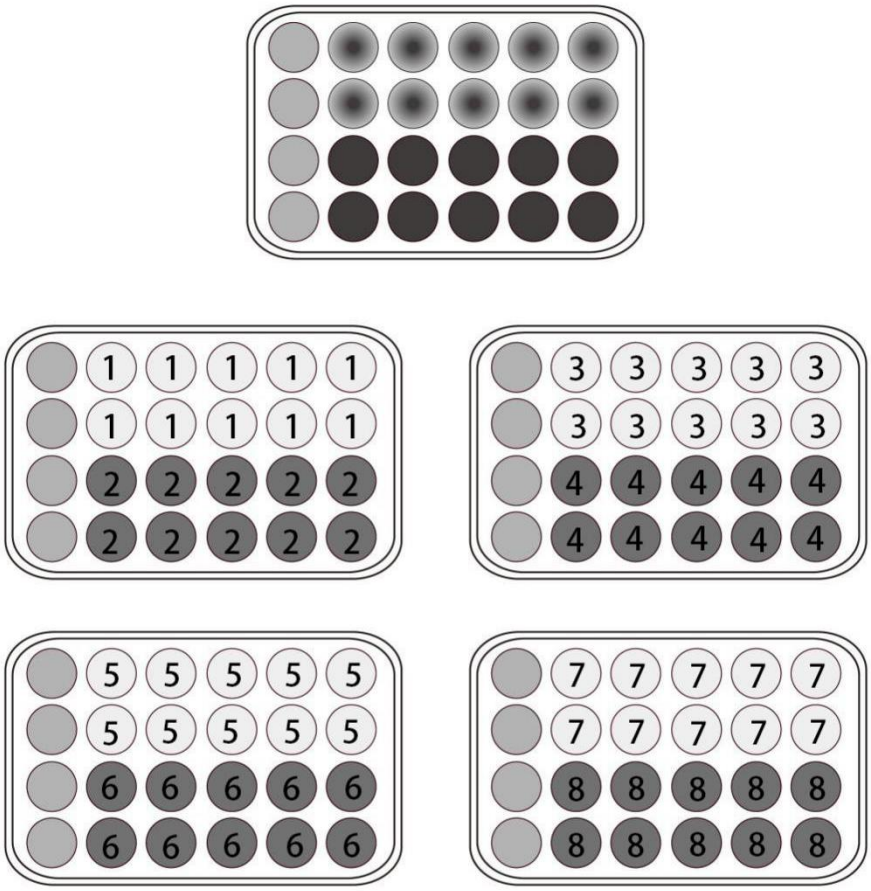

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