A-Level Biology

Lipids

Mark Scheme

Time available: 62 minutes
Marks available: 52 marks

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1.

(a) Carboxyl;

Accept carboxylic acid

1

(b) Type of R group

1. Unsaturated (fatty acid/hydrocarbon);

Explanation

Accept alkene

2. Double bond (between carbons);

Accept for 'double bond', C=C

2

(c) 1. Add ethanol/alcohol **then** add water **and** shake/mix

OR

Add ethanol/alcohol **and** shake/mix **then** pour into/add water;

Reject heating the emulsion test

*Accept 'Add Sudan III **and** mix'*

Ignore a second shake

2. White/milky (emulsion)

OR

(emulsion) test turns white/milky;

Ignore cloudy

Reject precipitate

Accept (for Sudan III) top (layer) red

2

(d) **(Similarity)**

1. Both have a phospholipid bilayer

OR

Both have fatty acid/hydrophobic tails pointing in/face each other

OR

Both have phosphate/polar/hydrophilic heads pointing out

OR

Both have protein;

Accept 2 marks max if 1. is not achieved

(Differences)

2. No channel/carrier proteins, whereas fluid mosaic does

OR

Protein layer outside (phospholipids), fluid mosaic is 'dotted';

Accept for 'no channel/carrier', no intrinsic

Accept only one type of protein whereas fluid mosaic has many (types)

3. Cholesterol is not present whereas it is present in fluid mosaic;

4. Glycoprotein is not present whereas it is present in fluid mosaic;

5. Glycolipid is not present whereas it is present in fluid mosaic;

Accept first answer refers to 1935 model unless otherwise stated

3 max

[8]

2. (a) 1. **One** glycerol and **three** fatty acids;

2. Condensation (reactions) **and** removal of **three** molecules of water;

3. Ester bond(s) (formed);

Accept all marks in suitably labelled diagram OR in a balanced equation

3

(b) Palmitoleic acid is an unsaturated fatty acid represented by diagram **K**;

1

(c) 1. To increase accuracy/resolution **because** differences/lengths are small;

2. To increase accuracy **because** reduces risk of human error;

3. To increase accuracy **because** roots are less (likely to be) damaged;

4. To reduce error/uncertainty **because** differences/lengths are small;

Ignore 'precision'

1 max

(d) 1. Population 1 grew longer roots in warm temperatures **and** population 2 grew longer roots in cool temperatures;

2. Standard deviations do not overlap so difference (in mean) unlikely to be/not due to chance;

Accept: 'Standard deviations do not overlap showing difference (in mean likely to be) significant'

3. Population 1 (is better adapted to warm conditions because it) has more saturated fatty acids so more energy available (and more growth);

4. Population 2 (is better adapted to cool conditions because it) has more unsaturated/liquid fatty acids so more lipase activity (and more growth);

Accept for 'fatty acids', fat

4

(e) Same species

OR

(If mated) can produce fertile offspring

OR

(It is) genus and species name;

1

[10]

3. (a) P – glycerol
Q – fatty acid (chains)

Accept phonetic spelling

2

(b) Ester (bond);

1

(c) 1. (Mix / shake sample) with ethanol, then water;

Sequence is important

2. White / milky (emulsion);

Ignore cloudy

Reject precipitate

2

[5]

4. (a) 1. Dissolve in alcohol, then add water;
2. White emulsion shows presence of lipid.

2

(b) Glycerol.

1

(c) Ester.

1

(d) **Y** (no mark)
Contains double bond between (adjacent) carbon atoms in hydrocarbon chain.

1

(e) 1. Divide mass of each lipid by total mass of all lipids (in that type of cell);
2. Multiply answer by 100.

2

(f) Red blood cells free in blood / not supported by other cells so cholesterol helps to maintain shape;

Allow converse for cell from ileum – cell supported by others in endothelium so cholesterol has less effect on maintaining shape.

1

(g) 1. Cell unable to change shape;
2. (Because) cell has a cell wall;
3. (Wall is) rigid / made of peptidoglycan / murein.

2 max

[10]

5. (a) 1. In phospholipid, one fatty acid replaced by a phosphate;

Ignore references to saturated and unsaturated

Accept Pi/PO_4^{3-} / (P)

Reject P/Phosphorus

Accept annotated diagrams

1

(b) 1. Add ethanol, then add water;

Reject ethanal/ethonal

Accept 'Alcohol/named alcohol'

2. White (emulsion shows lipid);

Accept milky – Ignore 'cloudy'

Sequence must be correct

If heated then DQ point 1

Reject precipitate

2

(c) Saturated single/no double bonds (between carbons)
OR
Unsaturated has (at least one) double bond (between carbons);

Accept hydrocarbon chain/R group for 'between carbons' for either

Accept Sat = max number of H atoms bound

'It' refers to saturated

1

(d) 1. (Fat substitute) is a different/wrong shape/not complementary;
OR
Bond between glycerol/fatty acid and propylene glycol different (to that between glycerol and fatty acid)/no ester bond;

2. Unable to fit/bind to (active site of) lipase/no ES complex formed;

If wrong bond name given (e.g. peptide/glycosidic), then penalise once

2

(e) It is hydrophilic/is polar/is too large/is too big;

Ignore 'Is not lipid soluble'

1

[7]

6.

(a) 1. Crush / grind;

2. With ethanol / alcohol;

3. Then add water / then add to water;

2. Water must be added <u>after</u> ethanol for third mark.

4. Forms emulsion / goes white / cloudy;

4. Do not accept carry out emulsion test.

3

(b) (i) 4 / four;

1

(ii) 1. Phosphate / PO_4;

"It" refers to phospholipid.

2. Instead of one of the fatty acids / and two fatty acids;

1. Accept minor errors in formula. Do not accept phosphorus / phosphorus group.

2

(iii) 1. Double bonds (present) / some / two carbons with only one hydrogen / (double bonds) between carbon atoms / not saturated with hydrogen;

Answer refers to unsaturated unless otherwise clearly indicated.

May be shown in appropriate diagram.

2. In (fatty acid) **C** / 3;

2

[8]

7.

Fatty acids used to make phospholipids;
Phospholipids in membranes;
More phospholipids more membranes made;

2 max

Fatty acids respired to release energy;
More triglycerides more energy released;
Energy used for cell production / production of named cell component;

Do not allow credit for 'making' energy

2 max

[4]