EXAM PAPERS PRACTICE

Lipids

Level: Edexcel A Level 9BN0
Subject: Biology
Exam Board: Suitable for all boards
Topic: Lipids
Type: Mark Scheme

To be used by all students preparing for Edexcel Biology A Level 9BN0 foundation or higher tier but also suitable for students of other boards.

Mark schemes

1 (a) (Omega-3 concentration) falls more rapidly at first;
Levels out at 140 days / concentration of 0.4%;

2

(b) (i) Two marks for correct answer of 0.04 or 0.043;;

One mark for incorrect answer which clearly identifies total fall of 1.7;

2

(ii) To take into account variation in fat content of milk / fat content varies from cow to cow;
Allows comparison;

2

(iii) The graph shows a decrease with time feeding on corn;
No control group;
Might have fallen anyway / might decrease with time rather than with time spend feeding on corn;
Other factors / other named factor might also have changed;
Only one investigation so might not be representative;

4 max

[10]

2 Standard deviation shows there is overlap of the 2 data sets;
Small sample of wild salmon so may not be representative of population;

[2]

3 (a) ATP

1

(b) (i) 2.57:1/2.6:1/18:7;
Correct answer however derived scores two marks
72:28 scores one mark
Correct working from wrong figures scores 1 mark

Accept

0.4 / 0.39 / 0.389 / 0.3889

2 max

(ii) Low intensity;
At low intensity/below 40% mainly fat used / at high intensity/ above 40% mainly carbohydrate used;
Long duration exercise;
Percentage fat used increases with time / percentage carbohydrate used decreases with time;

3

[6]

4

(a) Student was measuring change in pH
OR
Buffer would maintain a constant pH.

1 max

(b) 1. Volume of suspension of lipids;

2. Concentration of suspension of lipids;

3. Volume of lipase solution;

4. Temperature;

2 max

(c) Boiled lipase solution;

1

(d) –0.34 = 2 marks

0.34 = 1 mark

2

(e) 1. Fatty acids produced;

2. Curve levels off as all substrate used up.
accept the lower pH inactivates / denatures the enzyme

2

(f) 1. Faster fall in pH **and** levels off at same point;

2. More enzyme = substrate complexes formed;

3. Same amount of fatty acids produced / product

3

[11]

5

(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]

6

(a) **Two** suitable suggestions;
E.g.
1. (Are mammals so) likely to have same physiology / reactions as humans;
2. Small enough to keep in laboratory / produce enough milk to extract;
3. (Can use a) large number.

Ignore references to ethical issues

2 max

(b)
1. Hydrolysis of lipids produces fatty acids;
2. Which lower pH of mixture.

2

(c)
1. (Bile-activated lipase / it) increases growth rate (of kittens);
2. Results for formula with lipase not (significantly) different from breast milk / are (significantly) different from formula milk alone;
3. Showing addition of (bile-activated) lipase is the likely cause (of increased growth);
4. Lipase increases rate of digestion of lipids / absorption of fatty acids.

3 max

[7]

7

(a) Hydrolysis (reaction);

(b)
1. (Phosphate required) to make RNA;
2. (Phosphate required) to make DNA;

1 and 2. If neither DNA or RNA are named allow one mark for nucleotide/nucleic acid/phosphodiester bonds/sugar-phosphate backbone.

3. (Phosphate required) to make ATP/ADP;
4. (Phosphate required) to make membranes;

Ignore: phospholipids without reference to membranes.

5. (Phosphates required) for phosphorylation;

Accept: as additional mark points any named biological molecule containing phosphate e.g. NADP, AMP, RuBP.

2 max

(c) Accept answer in range from 3.7 : 1 to 4.1 : 1;

Reject any ratio not : 1.

1

(d) 1. Seeds/embryo remain dormant/inactive in winter/cold
OR
Growth/development of seed/embryo during winter/cold;

Ignore: hibernate.

Accept: 'seed survives winter/cold'.

Reject: plant develops or seed germinates during winter/cold.

2. Seeds/plants develop in spring/summer
OR
Seeds/plants develop when temperature/light increases;

Accept: seeds/plants develop when more light or when temperature is higher.

Accept: seed germinates/'sprouts' during spring/summer or when temp/light increases.

3. Plant photosynthesise (in spring/when warm);
4. Produce (more) seeds/offspring in spring/growing season;

3 max

[7]

8

(a) 1. Fewer children / less likely that children with asthma eat fish;

Accept converse.

2. Fewer children / less likely that children with asthma eat oily fish;

MP1 and 2 − Allow use of numbers.

3. Little / only 2% / no difference in (children with or without asthma who eat) non-oily fish.

Do not accept arguments related to amount of fish eaten

3

(b) 1. (Shake with) ethanol / alcohol;

1. Accept named alcohol

2. Then add (to) water;

2. Order must be correct

3. White / milky / cloudy (layer indicates oil).

3. Ignore forms emulsion as in stem

3. Ignore precipitate

3

[6]

9

(a) pH goes down and levels out;
after 30 min / pH 6.5;

2

(b) Enzyme not used up in reaction;

1

(c) Curve will be less steep:

*Only accept answers relating to curve **not** rate of reaction*

1

[4]

10 (a) Any **one** from:

1. Numerical readings / not subjective / colour change subjective / gives quantitative data / not qualitative / gives continuous data;
2. Greater accuracy;

Accept greater precision

1 max

(b) Fatty acids produced;

1

(c) 1. No more (fatty) acids produced;
2. All triglycerides/fat//lipids/substrate used up / enzyme denatured;

2

(d) 1. Line starting at same point and falling above original line;
2. Levels off at same pH, but later;

Accept the line still falling at 4 minutes

Do not credit if levels off at higher pH

2

[6]

11 (a) (i) (Molecule) made up of many identical / similar molecules / monomers / subunits;

Not necessary to refer to similarity with monomers.

1

(ii) Cellulose / glycogen / nucleic acid / DNA / RNA;

1

(b) (i) To keep pH constant;
A change in pH will slow the rate of the reaction / denature the amylase / optimum for reaction;

2

(ii) Purple / lilac / mauve / violet;
Do not allow blue or pink.

1

(iii) Protein present / the enzyme / amylase is a protein;
Not used up in the reaction / still present at the end of the reaction;

2

[7]

12 (a) (i) in case normal coffee differs in some other way / to control concentration of caffeine;

1

(ii) not telling them what the drink contained / purpose of experiment;

1

(b) (i) able to continue for longer; *(not just increases performance)*
(disqualify if also refers to fatty acids and glycerol)

1

(ii) breakdown of fats;
at increased rate / by mobilisation of fat stores;

2

(c) (i) idea that volumes of oxygen and carbon dioxide the same;
reference to equal moles, or quotient as 1 divided by 1 / or 6 by 6;

2

(ii) glycogen is a carbohydrate / broken down to glucose, linked to RQ;
with no caffeine, RQ nearer 1.0 / less carbon dioxide exhaled and
more oxygen inhaled (or vice versa) / with caffeine higher proportion of fats / fatty acids respired;
increased time to exhaustion suggests slower use of glycogen:

3

[10]

13 (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]

14 (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]

15 (a) Double bond(s);

(Bonds) between carbon;

C=C bond(s) = 2 marks

'No' C=C bond(s) disqualifies 1 mark only

Accept: does not contain maximum number of H for 1 mark

Neutral: contains C=O bonds

2

(b) Graph shows negative correlation / description given;

Correlation does not mean causation / prevention / shows lower risk not prevention;

May be due to another factor / example given;

Neutral: refs. to methodology e.g. sample size / line of best fit

***Q**: Do not allow 'casual' relationship*

3

(c) (i) Glycosidic;

Accept: if phonetically correct

Reject: ester bond

1

(ii) Contains glycerol / three fatty acids / forms three ester bonds;

Neutral: contains less fatty acids

Answers must refer to a triglyceride

Ignore refs. to incorrect bond names

Neutral: olestra has eight fatty acids / R groups

Reject: contains three glycerols

1

(iii) 9;

1

[8]

16 (a)

✓	✓	✓	
			✓
		✓	✓

One mark for each correct column

Mark ticks only and ignore crosses

4

(b) 1. Two marks for box round two hydrogens and one of the oxygens from OH groups on carbons 1 and 4;;

2. One mark from incorrect answer involving any two hydrogens and an oxygen from carbons 1 and 4;

Do not award marks if all atoms concerned are on same carbon atom or are on carbon atoms other than 1 and 4 or where the answer does not have two hydrogen and one oxygen

2

(c) (i) 1. Holds chains / cellulose molecules together / forms cross links between chains / cellulose molecules / forms microfibrils, providing strength / rigidity (to cellulose / cell wall);

2. Hydrogen bonds strong in large numbers;x

Principles here are first mark for where hydrogen bonds are formed and second for a consequence of this.

Accept microfibres

2

(ii) Compact / occupies small space / tightly packed;

Answer indicates depth required. Answers such as "good for storage", "easily stored" or "small" are insufficient.

1

[9]

17 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]

18 The different diet of the fish;
Omega-3 fatty acids used in respiration / as a source of energy;
Wild trout are more active / use more energy;

[2]

19 (a) Two marks for correct answer of 64.285 / 64.3 / 64;

(allow 1 mark for (8100 / 100 × 30) / 37.8)

2

(b) dissolve in / add ethanol then mix with water;
emulsion / white colour indicates triglycerides present;

2

(c) (i) increase the surface area for absorption;
(ignore wrong ref. to name)

1

(ii) **R** = tissue fluid / interstitial fluid / extracellular fluid / intercellular space;
S = lymph(atic) vessel / lymph capillary / lacteal;

2

(iii) proteins are synthesised by **U**;
involvement of ribosomes;
protein isolation / transport (inside RER);
vesicle formation;

2 max

(iv) exocytosis / description of;
because of size / too large to leave by other methods;

2

[11]

20 (a) (i) condensation;

1

(b) (i) **D**;

1

(ii) **C**;

1

(iii) **A**;

1

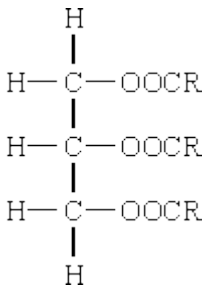
(c) absence of a double bond;
in the (hydrocarbon) chain;
unable to accept more hydrogen / saturated with hydrogen;

2 max

[6]

21 (a) 3 fatty acids attached;
ester bond correct;

(H on glycerol component, O attached to carbon, R at other end)



2

(b) not made of monomers / many repeating units;

1

(c) (many) mitochondria present in brown fat cells;
mitochondria release heat / energy; (*ignore ATP*)
white fat cells for fat storage / reduced fat storage in brown fat cells;

3

[6]