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EXAMINATION PREPARATION PAPER 2: MATTER AND MATERIALS

Learner Note: Make sure that you have studied how to draw out structural formulae and how to use the IUPAC naming system. You also need to know the difference between a condensed structural formula and a structural formula. Also know your basic terminology and definitions.

SECTION A: TYPICAL EXAM QUESTIONS**Question 1: 17 marks 20 minutes**

(Taken from DoE Physical Sciences Feb- Paper 2 2009)

There are two structural isomers for the organic compound with molecular formula $C_2H_4O_2$.

1.1 Define the term *structural isomer*. (2)

1.2 Write down the structural formula of these two isomers and next to each its IUPAC name (3 x 2) (6)

1.3 State with reason which ONE of these isomers:

1.3.1 Has the higher boiling point (3)

1.3.2 Has the higher vapour pressure (3)

1.4 Will the vapour pressure of carboxylic acids increase or decrease if the number of carbon atoms in the chain increases? Give a reason for your answer. (3)
[17]

Question 2: 9 marks 10 minutes

(Taken from the DoE Physical Sciences Feb – March Paper 2 2009)

Rubber is a naturally occurring compound. The diene, 2-methyl-1,3-butadiene, is one of the repeating units found in rubber.

Over 20 million families depend on rubber cultivation for their livelihood. Tens of thousands of hectares of tropical forests have been cleared to make way for rubber plantations.

Chemists have been able to combine other dienes to obtain synthetic rubbers. Some rubber products include latex products such as hand gloves, raincoats and other products used in the battle against HIV/Aids.

The world's largest use of rubber is in tyres, and most tyres contain both natural rubber, which withstands heat better, and one or more kinds of synthetic rubber.

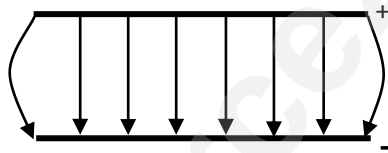
- 2.1 Is 2-methyl-1,3-butadiene an example of a saturated or an unsaturated hydrocarbon? Give a reason for your answer. (3)
- 2.2 Write down the structural formula of 2-methyl-1,3-butadiene. (2)
- 2.3 With regard to the environment, name TWO disadvantages of rubber and the production of rubber. (2)
- 2.4 With regard to human life, name TWO benefits of rubber and the production of rubber. (2)
- [9]

SECTION B: SOLUTIONS AND HINTS TO SESSION 36

Question 1:

- 1.1 Dielectric ✓
Distance between plates ✓ (2)

1.2.1



Checklist	Mark
Evenly spaced field lines.	✓
Direction of field lines from positive to negative.	✓
Field lines curved at the ends.	✓

- 1.2.2** (3)

$$C = \frac{\epsilon_0 A}{d} \checkmark = \frac{(8,85 \times 10^{-12}) \checkmark (2 \times 10^{-2}) \checkmark (10 \times 10^{-2})}{0,2 \times 10^{-3} \checkmark}$$

$$= 8,85 \times 10^{-11} \text{ F } \checkmark$$

(5)

[10]

Question 2:

2.1 The current through a conductor is directly proportional to the potential difference across its ends at constant temperature. ✓✓ (2)

2.2 Equal ✓

2 A divides equally at T (and since $I_M = 1 \text{ A}$ it follows that $I_N = 1 \text{ A}$) ✓

OR

$$I \propto \frac{1}{R}, \therefore R_M = R_N \quad (2)$$

2.3 $\text{emf} = IR + Ir \quad \checkmark \therefore 17 = 14 + Ir \quad \checkmark \therefore Ir = 3 \text{ V}$

$$r = \frac{V_{\text{lost}}}{I} \quad \checkmark = \frac{3}{2} \quad \checkmark = 1,5 \, \Omega \quad \checkmark \quad (5)$$

2.4 $V_N = IR_N \quad \checkmark = (1)(2) \quad \checkmark = 2 \text{ V} \quad \checkmark \quad (3)$

2.5 $V_Y = 14 - 2 = 12 \text{ V} \quad \checkmark$

$V_Y = IR_Y \quad \checkmark \therefore 12 = (2)R_Y \quad \checkmark$

$\therefore R_Y = 6 \, \Omega \quad \checkmark \quad (4)$

[16]

Question 3

3.1 AC – alternating current ✓

A separate slip ring connected to each wire. ✓ (2)

3.1.2 Increase in peak (or rms) voltage ✓

Increase in frequency ✓ (2)

3.1.3 The plane of the coil is parallel to the magnetic field. ✓

(1)

3.2 Advantage:

Less environmental pollution ✓ (noise, gases, etc.)

Disadvantage

- Will not operate in absence of wind. ✓
- Many windmills needed to generate sufficient electricity – unsightly appearance in environment. (2)

[7]