

Dement and Kleitman (sleep and dreams)

AS

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What you need to know

The syllabus asks the same things of every core study. For Dement and Kleitman (1957) you should be able to:

1. **Explain the psychology being investigated:** sleep, dreaming, REM and non-REM (NREM) sleep, and ultradian rhythms (cycles shorter than a day, such as the roughly 90-minute sleep cycle).
2. **Give the background:** why researchers wanted an objective, physical sign of dreaming instead of relying only on what people remember in the morning.
3. **State the three aims** of the study.
4. **Describe the procedure and its methodology:** the research methods (laboratory experiment, correlation, interview technique), the sample (size, sex, age, how it was chosen), the experimental design, the controls, the questions asked, the EEG as the technique for collecting data, and the variables that were changed and measured.
5. **Discuss the ethical issues**, such as confidentiality, consent, the right to withdraw, deception and protection from harm.
6. **Give the results:** the main numbers (dream recall in REM and NREM, dream-duration estimates, the narrative-length correlation) and the main qualitative findings (the dreams reported with different eye movements), and say how they could be shown, for example in a table or bar chart.
7. **State the conclusions** that were or could be drawn.
8. **Evaluate every part of the study:** its methods, sample, data, validity, reliability, generalisability, ethics and usefulness.
9. **Relate it to the AS issues and debates:** the application of psychology to everyday life and individual versus situational explanations. Nature versus nurture can also be argued. Children and animals were not used, so those two debates only apply as contrasts.
10. **Explain why it belongs to the biological approach** and compare it with the other biological core studies, Hassett et al. and Hölzel et al.

Understand it

Background: why look at eye movements?

Dreams are private. Before the 1950s the only way to study them was to ask people what they remembered when they woke up in the morning. Memories like this are patchy, and nobody could check whether a dream had really happened, when it happened or how long it lasted.

In 1953 researchers in Kleitman's laboratory had noticed that, several times a night, sleepers' eyes move quickly under their closed lids. Dement and Kleitman wanted to know whether these **rapid eye movements** are an outward sign of dreaming. If they were, dreaming could be studied **objectively**, by measuring the body, not just by trusting what people say. That is the point of the paper's subtitle: an objective method for the study of dreaming.

The psychology: sleep stages and ultradian rhythms

Sleep is not one steady state. An **EEG** (electroencephalograph) picks up the brain's electrical activity through electrodes on the scalp and draws it as wavy lines. The pattern changes through the night:

- **NREM sleep** (non-rapid eye movement) was divided into four stages. From stage 1 to stage 4 the brain waves become slower and larger, and the sleeper becomes harder to wake. There are no rapid eye movements.
- **REM sleep** (rapid eye movement, sometimes called stage 5) has a fast, low-voltage EEG pattern much like being awake, with bursts of rapid eye movements, while the muscles of the body are relaxed to the point of paralysis. It is the stage when dreams are most likely to be recalled, but not the only stage when people dream.

A sleeper moves through the NREM stages and into REM again and again. One cycle takes about **90 minutes**, so there are several REM periods each night. They come at fairly regular intervals and tend to get **longer** as the night goes on. A cycle like this, repeating more than once a day, is an **ultradian rhythm**.

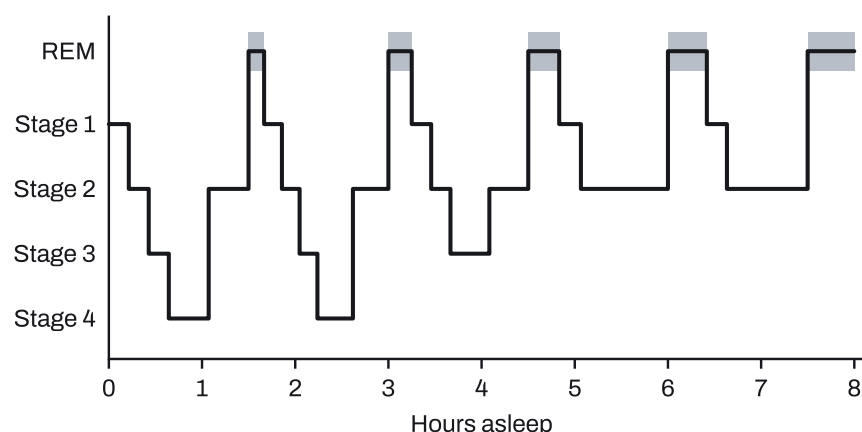


Illustration: a REM period about every 90 minutes, longer each time

The aims

The study had three aims, each matched to one part of the procedure:

1. To find out whether **dream recall differs** between REM and NREM sleep.
2. To find out whether there is a **positive relationship** between how long people think they have been dreaming and how long they had actually been in REM sleep.
3. To find out whether the **pattern of eye movements** during REM is related to **what the dream is about**.

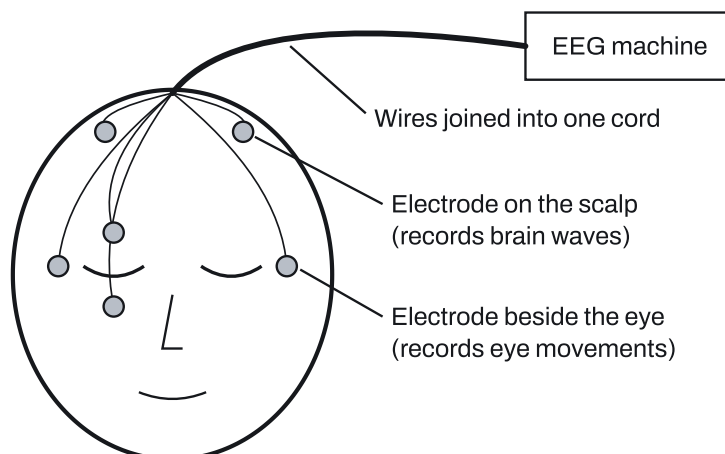
The sample

- **9 adults: 7 men and 2 women.**
- **5 were studied intensively** (many nights each). The other **4** were studied only **minimally**, to **confirm** the main results.
- The participants are known only by their **initials** (for example DN, KC, KK, WD).
- **Sampling technique: opportunity sampling** (accept snowball): some of the participants were sleep researchers and members of their families. Examiners do not accept "volunteer sampling".

The procedure

Before each night. Participants were told to **eat normally** and to **avoid alcohol and caffeine** on the day of the study. They arrived at the laboratory **shortly before their usual bedtime**.

The EEG. Electrodes were attached **beside the eyes** (to pick up eye movements; this part is sometimes called an EOG) and **on the scalp** (to pick up brain waves). All the lead wires were fixed to the **top of the head** and gathered into **one cord**, like a ponytail, so that the sleeper could turn over freely without the wires tangling. Participants slept in a quiet, dark room and the EEG ran **continuously all night**. The paper moved at 3 or 6 mm per second, slow enough to save paper and fast enough for each eye movement to be clearly visible. The electrodes beside the eyes also showed the **direction** of each eye movement (up and down or side to side).



The single cord lets the sleeper turn over without tangling the wires.

Waking and the interview. At various times in the night the experimenter, watching the EEG, woke the participant with a **loud doorbell** placed near the bed. The participant then spoke into a **recording device** beside the bed: first whether they had been dreaming, then, if they had, what the dream was about. Sometimes the experimenter came into the room to ask more questions about the dream. Participants were **never told** whether they had been woken in REM or NREM sleep.

The order of REM and NREM awakenings was varied so that participants could not learn a pattern: for some it was decided from a table of random numbers, for one it followed blocks of three REM then three NREM awakenings, for one it was the experimenter's choice, and one was told he would be woken only when he was dreaming, although he was actually woken at random.

The three parts of the study, matching the three aims:

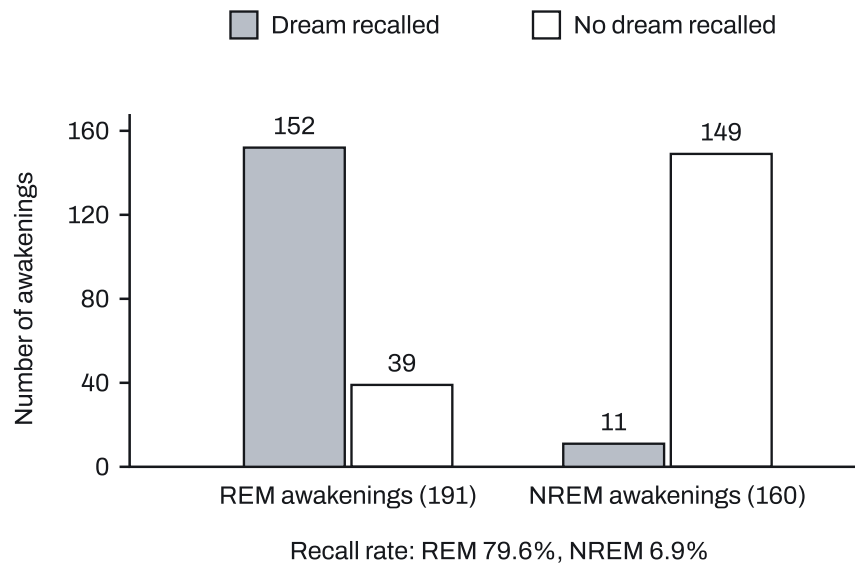
1. **Dream recall in REM and NREM.** Participants were woken either during REM or during NREM sleep and asked whether they had been dreaming and what the dream was about. This is a **laboratory experiment** with a **repeated measures design**: each participant was woken in both stages. The **IV** is the stage of sleep at waking (REM or NREM); the **DV** is whether a dream was recalled.
2. **Dream-duration estimates.** Participants were woken either **5 minutes** or **15 minutes** after a REM period began, chosen **at random**, and had to say whether they thought they had been dreaming for 5 or 15 minutes (a closed, forced-choice question). The number of **words in each dream narrative** was also counted and compared with how long the REM period had lasted: this part is **correlational**.
3. **Eye-movement direction and dream content.** Participants were woken about **1 minute** after a particular pattern of eye movements (mainly vertical, mainly horizontal, both, or very little movement) and asked to describe the dream in detail.

The results

1. REM versus NREM recall.

Awakenings	Dream recalled	No dream recalled	Total	Recall rate
REM	152	39	191	79.6%
NREM	11	149	160	6.9%

- Dreams were recalled after about **80%** of REM awakenings but only about **7%** of NREM awakenings.
- Of all **163** dreams recalled, **93%** came from REM awakenings and **7%** from NREM.
- Every participant recalled more dreams from REM than NREM. **KK**, for example, recalled no dreams at all from NREM. **WD** had the highest REM recall.
- The few NREM dreams were mostly reported soon after a REM period had ended, and NREM reports were usually vague, more like fragments of thought than vivid dreams.
- **First and second half of the night:** for the 5 participants studied intensively, slightly more dreams were recalled from REM awakenings in the **first** half of the night (and slightly fewer "no dream" reports). For the whole sample of 9 the pattern went the other way: more dreams were recalled in the **second** half.



2. Dream-duration estimates.

- After **5 minutes** of REM, estimates were right **45** times and wrong **6** times (88%).
- After **15 minutes**, they were right **47** times and wrong **13** times (78%). So people were good at judging dream length, but slightly less accurate at 15 minutes than at 5.
- **DN** did not fit the pattern: he was right on 8 of his 10 five-minute trials (80%) but only 5 of his 10 fifteen-minute trials (50%), and he tended to **underestimate** how long he had been dreaming.
- **Narrative length**: there was a **positive correlation** for each participant studied intensively: the longer the REM period before waking, the more words in the dream narrative (correlations of roughly 0.4 to 0.7).

3. Eye movements and dream content (qualitative results).

- **Vertical** eye movements: standing at the bottom of a cliff operating a hoist and looking up at climbers; climbing a series of ladders, looking up and down while climbing; throwing basketballs at a net, looking up to shoot and down to pick up the next ball.
- **Horizontal** eye movements: watching two people throw tomatoes at each other (the only mainly horizontal case).
- **Driving dreams**: two dreams involved driving a car and staring at the road ahead. In one, a car suddenly sped towards the dreamer from the left at a crossroads; in the other, the dreamer noticed a man at the side of the road asking for a lift. The sudden glance to one side is a horizontal movement, and examiners have credited these as horizontal-movement dreams.
- **Very little movement**: dreams of watching something in the distance or staring fixedly at one thing.
- **Mixed movements**: dreams of looking at people or things close by.

The conclusions

Conclusions are general statements about sleep and dreaming, not results:

- **Dreaming happens mainly during REM sleep**, so REM is an objective sign that a person is dreaming.

- **Dreams happen in real time:** they are not instant flashes, because people can judge how long they have been dreaming and longer REM periods give longer dream reports.
- **Eye movements during REM match what the dreamer is looking at in the dream:** they are not random.

Methods, data and why it is biological

- **Research methods:** laboratory experiment (REM vs NREM; 5 vs 15 minutes), correlation (REM length and number of words), and an interview technique (dream reports, with follow-up questions).
- **Data: quantitative** (numbers of dreams recalled, correct estimates, word counts, EEG records) and **qualitative** (the descriptions of dreams).
- **Biological approach:** it explains a mental experience, dreaming, through measurable activity of the body: brain waves and eye movements recorded by the EEG. This fits the assumption that behaviour and cognition can be explained by the workings of the brain.

Key facts and formulas

There is no formula list in the 9990 exam. "Learn it" means you must remember it.

Fact	Status
Dement and Kleitman: 9 adults (7 men, 2 women); 5 studied intensively, 4 used to confirm the results; opportunity sample	Learn it
Dement and Kleitman controls: no alcohol or caffeine, eat normally, arrive shortly before usual bedtime	Learn it
Dement and Kleitman EEG: electrodes beside the eyes and on the scalp, wires gathered at the top of the head into one cord, recording all night	Learn it
Dement and Kleitman recall: REM 152 of 191 awakenings (79.6%); NREM 11 of 160 (6.9%); 93% of recalled dreams came from REM	Learn it
Dement and Kleitman estimates: 5 minutes right 45 times, wrong 6; 15 minutes right 47 times, wrong 13 (78%)	Learn it
REM sleep: rapid eye movements, fast low-voltage brain waves, body paralysed, most dream recall; occurs about every 90 minutes (an ultradian rhythm)	Learn it
Percentage recall = $\frac{\text{awakenings with a dream recalled}}{\text{total awakenings in that stage}} \times 100$	Learn it
Range = largest value – smallest value	Learn it

How to do it

We have tagged 38 questions on this study, from 2021 to 2026 (Papers 1 and 2). 21 of them have parts of two or three types, so the counts add up to 61.

Question type	Questions
Procedure, sample and apparatus	14
Results, including the dreams reported	13
Evaluation: validity, reliability, sample and ethics	10
Aims and conclusions	6
Issues, debates and applications	6
Research methods applied to the study	5
Comparing with another study	4
The psychology investigated: sleep, REM and NREM	3

1. Procedure, sample and apparatus (14 questions)

These are mostly 1–4 mark recall questions, with one mark per correct point.

1. **Find which part of the procedure is asked about.** "How dream recall was investigated" means the doorbell, waking in REM or NREM, speaking into the recorder, saying whether you dreamt and then the content, and the experimenter sometimes asking more. It does **not** mean the 5- or 15-minute estimates.
2. **Give separate, specific points**, one per mark: "electrodes beside the eyes" and "electrodes on the scalp" are two marks; "on the head" is too vague.
3. **Use the numbers exactly**: 9 participants, 7 men, 2 women, 5 intensive, 4 minimal. Check that your numbers add up to 9.

Variations you will meet:

- **Sample features** ("identify two/three features"): adults; 7 men; 2 women; 9 in total; 5 studied intensively; 4 used to confirm results; opportunity sample. Don't repeat the feature given in the question, and don't write "equal numbers of men and women" or "some withdrew".
- **The sampling technique**: opportunity (or snowball), because some were sleep researchers and their families.
- **Instructions before the study**: must not drink alcohol or caffeine; must eat normally and arrive shortly before their usual bedtime.
- **The EEG**: where the electrodes were, why the wires went into one cord (free movement, no tangling), that it ran all night, that the eye-movement record showed which stage the sleeper was in so the experimenter could wake them in REM or NREM, and that it showed the direction of eye movements.

- **How a participant would be woken and questioned** (sometimes set as advice to a friend in a replication): woken by a loud doorbell; asked to say into a recorder whether they had been dreaming; then describe the dream; the experimenter might come in to ask more; they might be asked whether they had been dreaming for 5 or 15 minutes. Write it to the person if the question does ("You will be woken by...").
- **How 5 or 15 minutes was chosen**: at random.
- **Single facts**: the other interval was 15 minutes; the apparatus was an EEG; 5 were studied intensively.

2. Results, including the dreams reported (13 questions)

1. **Use a meaningful comparison.** A result with a comparison earns the full 2 marks: "more dreams were recalled after REM awakenings than after NREM awakenings". Without the comparison ("more dreams were recalled in REM") it earns 1.
2. **Add correct data when asked** ("You must use data"): 152 dreams recalled from REM against 11 from NREM, or 79.6% against about 7% of awakenings, or 93% against 7% of dreams.
3. **Never say people dream only in REM**: 11 dreams were recalled from NREM.

Variations you will meet:

- **Dream-duration results**: compare 5 and 15 minutes (45 right and 6 wrong against 47 right and 13 wrong), or say that on 78% of 15-minute trials the estimate was correct. Saying "78% of participants" is wrong: the 78% is of trials.
- **DN**: right 80% of the time at 5 minutes but only 50% at 15 minutes; he often underestimated.
- **The correlation**: positive, between the number of words in the narrative and the minutes of REM before waking. Say both variables.
- **Outline a dream**: a 2-mark dream has the setting plus the looking ("climbing ladders and looking up and down as he climbed"); the setting alone ("climbing ladders") earns 1. Learn the vertical ones (cliff and hoist, ladders, basketball), the horizontal one (tomatoes) and the two driving dreams.
- **First and second half of the night**: say which group you mean. For the 5 intensive participants, slightly more recall in the first half; for all 9, more recall in the second half.
- **"What psychologists learned"** using results: give the result with its comparison and data, then explain what it shows (for example, eye movements are not random because the direction matched where the dreamer was looking).

3. Evaluation: validity, reliability, sample and ethics (10 questions)

Short questions (2–4 marks). Identify the strength or weakness (1 mark), then explain it with a detail from this study (1 mark). Use these:

Point	Strength or weakness	Example from the study
Controls (internal validity)	Strength	No alcohol or caffeine, same doorbell, participants not told their stage, so differences in recall were caused by the stage of sleep

Point	Strength or weakness	Example from the study
Standardised procedure (reliability)	Strength	Same EEG set-up, same waking method and same questions every time, so it can be replicated and checked
Objective quantitative data	Strength	The EEG record and the counts of dreams and words don't depend on the researcher's opinion and can be compared directly
Qualitative data	Strength	Detailed dream descriptions let the researchers match eye direction to dream content, which numbers alone could not show
Ecological validity	Weakness	Sleeping in a laboratory, wired to an EEG and woken by a bell, is not normal sleep; it might change sleep and dream patterns
Small, unrepresentative sample (generalisability)	Weakness	Only 9 people, 5 studied in depth, mostly men, some of them sleep researchers; their sleep may not be typical
Demand characteristics or bias	Weakness	Sleep researchers among the participants could know the aim and report what they thought was expected
Self-report (validity)	Weakness	Dream reports can't be checked; people may forget, invent or leave out content they find embarrassing
Ethics	Mixed	Initials kept identities secret and the EEG is safe, but sleep was broken many times a night and one participant was misled about when he would be woken

Variations you will meet:

- **Why a control mattered for validity:** say what it prevented (alcohol and caffeine change sleep and dreaming, so the sleep would not be typical) and that this means changes in the DV were caused by the IV.
- **Two weaknesses of the sample:** make them **different** (small sample, too few women, researchers who knew the aim). Two points that are both about generalisability count once.
- **Ethics:** outline the guideline first (confidentiality is keeping participants' identities and data secret; informed consent is telling people enough about the study beforehand that they can decide whether to take part), then link it: only the participants' initials and sex were published. "Their names were not published" is generic (1 mark); the initials make it linked (2 marks).

The 10-mark evaluation ("two strengths and two weaknesses, at least one about ..."):

1. Plan four points of **equal depth**, one of which is the **named issue** (reliability, qualitative data, generalisability and so on). Without the named issue the answer is capped at Level 3 (6 marks).
2. For each point: say what the issue is, say whether it is a strength or weakness of **this** study, give **two** specific details from the study, and explain **why** it matters (what it does to the conclusions).
3. Don't describe the study for its own sake: description earns nothing here.

4. Avoid using "application" as a strength unless you tie it to a real strength, for example good controls make the REM–dream link trustworthy enough to use in diagnosing sleep disorders.

4. Aims and conclusions (6 questions)

1. **An aim** says what was investigated, with both variables: "to investigate whether dream recall differs between REM and NREM sleep" (2 marks). "To investigate sleep and dreams" is too brief (1 mark). If one aim is given in the question, give a different one.
2. **A conclusion** is a general claim, not data: "dreams happen in real time, not in an instant" (2 marks); "eye movements during REM correspond to where the dreamer is looking in the dream, so they are not random" (2 marks). "Eye movements match dreams" or "dreaming happens more in REM" is brief (1 mark). "More dreams were recalled in REM than NREM" is a **result** and earns nothing as a conclusion.

5. Issues, debates and applications (6 questions)

Individual and situational explanations (4 marks: 1 for each side's meaning, 1 for each example from the study):

- **Individual:** behaviour comes from factors **within the person**, such as personality or biology. Example: each participant's dreams were unique (one watched people throwing tomatoes), and DN was much worse at judging 15 minutes than the others.
- **Situational:** behaviour comes from the **external environment**. Example: sleeping in a strange laboratory, wired to an EEG and woken by a bell, may have changed how easily participants slept, how much they recalled or what they dreamt about.
- Define each side **without** reusing the word ("individual factors" to define individual earns nothing), and label which is which. "Different people have different dreams" is too vague for the individual example.

Applications to everyday life (2 marks each: what the application is, then how it would work, using the study):

- **Diagnosing sleep disorders:** record a patient's sleep with an EEG all night and compare their pattern of REM and NREM with a typical pattern, such as a REM period about every 90 minutes.
- **Dream work in therapy:** a device that detects REM wakes the client during REM, when recall is most likely, and they describe the dream straight away.
- **Better sleep:** a sleep app or watch tracks time in each stage so that people can see whether they get enough REM.
- The "how" must be explicit: "use an EEG to see if a patient has a sleep disorder" is not enough. Two applications must be really different (not two named sleep disorders), and they must be ethical.

Why it is biological: it measured brain activity (EEG) and eye movements and linked them to sleep stages and dream content, explaining a mental experience by the body's activity. A general assumption of the approach earns at most 1 mark; tie it to the study.

6. Research methods applied to the study (5 questions)

These test research methods using this study as the example.

- **Type of data from counting words:** quantitative, because it is a number. A strength: it can be compared objectively, for example the number of words after short and long REM periods, without anyone judging how "detailed" a dream was.
- **Null hypothesis for the 5 vs 15 minutes part:** "There will be no difference between dream-duration estimates after 5 minutes and after 15 minutes of REM sleep" (or "any difference is due to chance"). Don't write a correlation for this part.
- **Range of hours slept:** take the shortest number of hours slept from the longest. Mention hours slept to get the second mark.
- **An open question:** asking participants to describe their dream into the recorder. "Did you have a dream?" and "5 or 15 minutes?" are closed.
- **Why an EEG suits sleep better than fMRI:** give the reason and link it to sleep. An fMRI scanner is very noisy, which would stop people sleeping; an EEG is silent. An fMRI means lying still in a tight tube all night, which could trigger claustrophobia; EEG wires let the sleeper move. EEG shows REM and NREM moment by moment through the night. Keep to brain activity if the question does.

7. Comparing with another study (4 questions)

The 8-mark part of Paper 1 Question 9 or 10: explain two similarities or differences (or one of each), **4 marks each**, marked in levels:

Level	What it needs
4	The point is well explained, with an example from both studies
3	Well explained with one study's example, or both studies used briefly
2	Brief, with an attempt at one example; or well explained with no example
1	Brief, with no examples

1. **Choose a point you can develop:** technique for studying the brain, sample (size, sampling technique, generalisability), type of data, experimental design, ethics. "They had different aims" or "both studied biology" stays in Level 1.
2. **State the point, give each study's detail, then explain** what follows (for example, which one gives more information or generalises better).
3. **Obey the question's conditions:** if one point must be about the brain technique, make it so; if brain techniques are banned, use something else.

Useful points:

- **EEG vs MRI** (Hölzel et al., or any other study that scanned the brain): Dement and Kleitman's EEG recorded brain-wave activity through the night, showing the brain's **function** in real time, while Hölzel et al.'s MRI scans showed the brain's **structure** (grey matter) before and after a mindfulness course. To

reach Level 2 or above, say what each technique measured.

- **Quantitative data** (similarity with Hassett et al.): Dement and Kleitman counted dreams recalled after REM and NREM awakenings; Hassett et al. recorded how often and how long monkeys played with wheeled and plush toys. Both allow direct comparison between conditions.
- **Repeated measures for one comparison** (partial similarity with Hassett et al.): every Dement and Kleitman participant was woken in both REM and NREM, and in Hassett et al. each monkey's play with wheeled and plush toys was compared within that monkey. But Hassett et al.'s main comparison, males against females, was **independent measures**, so make clear the similarity is about toy type only.
- **Opportunity samples** (similarity with Hassett et al., safe when brain techniques are banned): Dement and Kleitman used people who were easy to reach, including sleep researchers and their families; Hassett et al. used the monkeys already living at one research centre. Neither sample was chosen to represent a wider population, so both are hard to generalise.
- **Ethics**: both avoided lasting harm (the EEG is painless; the monkeys stayed in their own social groups and were simply given toys), but Dement and Kleitman's participants had their sleep broken many times a night.
- **Sample**: Dement and Kleitman used 9 adults, an opportunity sample including sleep researchers, so it is hard to generalise; say how the other study's sample differs and what that does to generalisation. "Different species" on its own is only Level 1.

8. The psychology investigated: sleep, REM and NREM (3 questions)

1. **Describe REM sleep**, one point per mark: rapid eye movements; body paralysed; most dream recall; fast, low-voltage brain waves like being awake; comes in cycles about every 90 minutes; REM periods get longer through the night (lasting roughly 3 to 50 minutes, about 20 on average); the last stage of each cycle.
2. **Differences between REM and NREM** (state each as a comparison): more dream recall in REM; different brain waves (REM like waking, NREM slower); NREM has four stages, REM is one; NREM reports are thought-like and vague, REM reports are vivid; more NREM early in the night and more REM later; rapid eye movements only in REM.
3. **"Describe the psychology being investigated"**: explain the concepts (REM, NREM, dreaming, EEG, ultradian rhythm) and add one explicit example from the study for the example mark.

Don't describe dream content when asked what REM is, and don't say dreaming happens only in REM.

Worked examples

Example 1

From the study by Dement and Kleitman (sleep and dreams):

- (a) Describe how participants were prepared for sleep once they arrived at the laboratory. [3]

(b) Outline one result about dream-duration estimates. You must use data in your answer. [3]

(a) Electrodes were attached beside the participant's eyes to record eye movements (1). Electrodes were attached to the scalp to record brain waves (1). All the wires were fixed to the top of the head and gathered into one cord so the participant could turn over freely in bed (1). They then slept in a quiet, dark room with the EEG running all night (a further creditworthy point).

(b) Participants were more accurate at judging a 5-minute dream than a 15-minute dream (2: **result with a meaningful comparison**): after 5 minutes of REM they were right 45 times and wrong 6 times, but after 15 minutes they were wrong 13 times out of 60, giving 78% correct (1: **correct data**).

Example 2

From the study by Dement and Kleitman (sleep and dreams):

(a) Explain one strength of using an EEG to identify when participants were dreaming. [2]

(b) Explain one weakness of asking participants to report their dreams into a recording device. [2]

(a) The EEG gives an objective record of the stage of sleep, so it does not depend on what participants say or on the researcher's opinion (1: **strength identified**). The experimenter could see from the eye-movement trace exactly when a REM period had started, so they could wake participants after precisely 5 or 15 minutes of REM (1: **example from the study**).

(b) Dream reports are self-report data that can't be checked, which lowers validity (1: **weakness identified**). A participant woken by the doorbell might be confused and forget part of the dream, or leave out content they found embarrassing, so the recorded narrative may not match what they really dreamt (1: **example from the study**).

Example 3

(a) From the study by Dement and Kleitman (sleep and dreams), describe two controls that were used. [4]

(b) Explain one similarity and one difference between the study by Dement and Kleitman (sleep and dreams) and the study by Hassett et al. (monkey toy preferences). Your similarity must be about the experimental design and your difference must be about the sample. [8]

(a) Participants were told not to drink alcohol or caffeine on the day of the study (1), because these change sleep and could have affected dreaming (1). Participants were not told whether they had been woken in REM or NREM sleep (1), so their answers could not be shaped by what they expected to dream in each stage (1).

(b) **Similarity (experimental design)**. Both studies used a repeated measures design for one comparison. Every Dement and Kleitman participant was woken in both REM and NREM sleep, and in Hassett et al. each monkey's play with wheeled toys was compared with its own play with plush toys. Comparing each individual with themselves means differences between individuals, such as how well someone sleeps or how playful a

monkey is, could not explain the difference between the conditions. The similarity is about toy type only: Hassett et al.'s comparison of males with females was independent measures, because each monkey is either male or female. **(Level 4: well explained, with an example from both studies.)**

Difference (the sample). The samples were very different in size and kind. Dement and Kleitman studied only 9 adult humans, 5 of them in depth, chosen by opportunity sampling, and some were sleep researchers or their relatives. Hassett et al. studied a larger group of rhesus monkeys of both sexes, living in social groups at a research centre. So Dement and Kleitman's findings are hard to generalise to most people's sleep, because a small sample of researchers and their families may not be typical, while Hassett et al.'s findings, though from more individuals, can only be applied to children with caution because the participants were not human. **(Level 4.)**

Each point is worth 4 marks, so 8 in total. "Both used living things" or "Hassett used monkeys and Dement used humans" on its own would stay in Level 1.

Example 4

Evaluate the study by Dement and Kleitman (sleep and dreams) in terms of two strengths and two weaknesses. At least one of your evaluation points must be about generalisability. **[10]**

Plan: strengths are controls and quantitative data; weaknesses are generalisability (the named issue) and ecological validity. Each paragraph has the point, two details from the study and why it matters.

Strength 1: controls. The study was well controlled, which raises internal validity. Participants avoided alcohol and caffeine, which affect sleep, and they were never told which stage they were woken from, so they could not shape their answers to fit. The same doorbell and the same questions were used every time. So the large difference in recall between REM and NREM awakenings can be put down to the stage of sleep, not to other variables.

Strength 2: quantitative data. The study produced objective numbers: 152 dreams recalled from 191 REM awakenings against 11 from 160 NREM awakenings, and word counts that correlated with REM length. These can be compared directly and do not need the researcher's interpretation, which makes the conclusion that dreaming happens mainly in REM more convincing than a description would be.

Weakness 1: generalisability (the named issue). The sample was small and unusual: 9 adults, only 5 studied in depth, 7 of them men, and some of them sleep researchers and their families chosen by opportunity sampling. Their sleep and dreams may differ from other people's, for example from women's or from people who sleep badly, so it is hard to say that 80% of REM awakenings would produce a dream in the general population.

Weakness 2: ecological validity. Participants slept in a laboratory with electrodes on their face and scalp and were woken repeatedly by a bell. This is unlike sleeping at home, so the number and length of REM periods, and the content of the dreams, may not be the same as on a normal night. The results may therefore describe laboratory sleep more than everyday sleep.

How it would be marked: four points of equal depth, each with specific evidence from the study and an explanation of why it matters, including the named issue: Level 4 (8–10 marks). Leaving out generalisability would cap it at 6.

Common mistakes

- **Saying dreams happen only in REM.** 11 dreams were recalled from NREM awakenings. Write "more dreams were recalled in REM than NREM".
- **Giving a result as a conclusion.** "More dreams in REM than NREM" is a result. A conclusion is a general claim about dreaming, such as "dreams happen in real time".
- **Answering about the wrong part of the procedure.** A question about how dream recall was investigated is about waking and reporting, not the 5- and 15-minute estimates; a question about the narrative correlation is about word counts, not duration estimates.
- **Getting the sample wrong.** Numbers that don't add up to 9, "equal numbers of men and women", "some withdrew", or "volunteer sampling". It was 7 men and 2 women, chosen by opportunity sampling.
- **Vague EEG answers.** "On the eyes", "on the head" or "in the brain" earn nothing. Say beside the eyes, on the scalp, wires to the top of the head in one cord.
- **Dreams without the looking.** "Climbing ladders" earns 1 mark; add "looking up and down as he climbed" for 2. Don't invent dreams, such as tomatoes thrown in a car.
- **Results without a comparison.** "Most dreams were in REM" earns 1; compare REM with NREM for 2. And 78% is of 15-minute **trials**, not of participants.
- **Generic evaluation.** Points like "it lacks ecological validity" with no example from this study stay in the lowest level. Every point needs evidence from Dement and Kleitman.
- **Two points that are really one.** Two sample weaknesses that are both "can't generalise", or two applications that are two named sleep disorders, count once.
- **Defining a debate with its own name.** "Individual explanations are about individual factors" earns nothing.
- **Comparing aims or species.** "They had different aims" or "different species" stays in Level 1 of a comparison question.
- **An application with no "how".** Say exactly how the EEG or REM waking would be used.

How to get the marks

- **"Identify" and "state"** need a short exact answer: a number, a name, a feature. Only the first answer is marked when one is asked for.
- **"Outline"** needs the point with a little detail: a 2-mark dream needs the setting and where the dreamer was looking; a 2-mark aim names both things being related.
- **"Describe"** needs several separate points, one mark each.
- **"Explain"** needs a reason and a link to this study: the weakness or strength (1 mark) and the example from Dement and Kleitman (1 mark).

- **"You must use data"**: give an actual figure (152 and 11, 79.6% and about 7%, 93% and 7%, 45/6 and 47/13). Data in the right direction but slightly wrong can still earn the comparison marks.
- **"Suggest"** wants something sensible that fits the study, not one fixed answer.
- **Comparisons** (8 marks): two points of equal depth, each with an example from **both** studies and an explanation.
- **"Evaluate ... two strengths and two weaknesses"** (10 marks): four equal points, the named issue included, specific evidence in each, no description.
- **Applications**: what it is (1) and how it is done using the study (1), and ethical.
- **Conclusions**: general statements only; results earn nothing there.

Quick check

1. State the number of men and the number of women in the sample, and the number of participants studied intensively.
2. Calculate the percentage of NREM awakenings after which a dream was recalled, to 1 decimal place.
3. Which direction of eye movement went with the ladder-climbing dream, and which with the tomato-throwing dream? Explain how these two dreams support one conclusion of the study.
4. In a replication, five dream narratives had 120, 85, 210, 64 and 150 words. Calculate the range, and explain one strength of using word counts in this study.
5. Explain one way the study by Dement and Kleitman could be said to lack ecological validity.

Answers

1. 7 men and 2 women (9 in total); 5 were studied intensively.
2. $\frac{11}{160} \times 100 = 6.875$, so **6.9%**.
3. Ladders: mainly vertical eye movements (the dreamer looked up and down while climbing). Tomatoes: mainly horizontal movements (the dreamer looked from one thrower to the other). In both, the eyes moved the way the dreamer was looking in the dream, which supports the conclusion that eye movements in REM follow the dream's content and are not random.
4. Range = $210 - 64 = 146$ words. Word counts are quantitative and objective, so narratives after short and long REM periods can be compared without anyone having to judge how detailed a dream was.
5. Sleeping in a laboratory, wired to an EEG and woken by a loud doorbell is unlike sleeping at home (identification), so participants' sleep and dreams on those nights may not represent their normal sleep (example from the study).

Past questions to try

- **9990/11/M/J/24 Q9**: two dreams, then two differences with another biological study, one about the sample.
- **9990/13/M/J/23 Q10**: the 10-mark evaluation, with reliability as the named issue.
- **9990/11/O/N/22 Q1**: the procedure used to investigate dream recall.
- **9990/12/M/J/24 Q3**: results about REM recall and 15-minute estimates, then a weakness.