Why Is Ice Slippery?

Not because your weight melts it: that lowers the melting point by only a fraction of a degree. A thin liquid-like surface layer (premelting) and frictional melting do the work, and scientists still debate the details.

Name: Date: Score: ____ / 17

A. Fill in the blanks

1. The old idea that our weight melts ice is called ____ melting.

2. A liquid-like layer on ice below 0 °C is called ____.

3. The premelting layer was first proposed by Michael ____.

4. Sliding produces heat because of ____.

B. True or False

5. Pressure from our weight lowers the melting point of ice by several degrees. True / False

6. Ice can be slippery even at −30 °C. True / False

7. A moving skate can melt a thin water film by friction. True / False

8. Scientists fully agree on why ice is slippery. True / False

C. Assertion and reason

9. Assertion (A): Ice is slippery even when you stand still.
Reason (R): A liquid-like layer covers ice below 0 °C.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

10. Assertion (A): Pressure melting explains slipping at −30 °C.
Reason (R): Pressure lowers the melting point of ice.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

11. Why does pressure melting fail as the full explanation?

(a) ice is too hard
(b) the melting point falls only a fraction of a degree
(c) pressure raises the melting point
(d) ice has no surface

Answer: _____

12. Premelting means:

(a) ice melting at 0 °C
(b) a liquid-like surface layer below 0 °C
(c) water freezing
(d) ice turning into vapour

Answer: _____

13. Frictional melting matters most for:

(a) a person standing still
(b) a moving skater
(c) ice in a freezer
(d) falling snow

Answer: _____

E. Numerical problems

14. Pressure lowers ice's melting point by about 0.0074 °C per atmosphere. By how much does a pressure of 100 atmospheres lower it?

F. Short answer questions

15. Explain the three ideas proposed for why ice is slippery.

16. Why is this called an open question?

G. Match the columns

17. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. Pressure melting	(a) Too small an effect	1 → ____
2. Friction	(b) Liquid-like layer below 0 °C	2 → ____
3. Premelting	(c) Proposed the surface layer	3 → ____
4. Faraday	(d) Melts a film under a moving skate	4 → ____

Detailed solutions

1. pressure

2. premelting

3. Faraday

4. friction

5. False. Only by a fraction of a degree.

6. True. Which pressure melting cannot explain.

7. True. Frictional heating melts the surface.

8. False. The details are still debated.

9. (a) Premelting works without motion.

10. (d) A is false (the effect is a fraction of a degree); R is true.

11. (b) the melting point falls only a fraction of a degree. The effect is far too small.

12. (b) a liquid-like surface layer below 0 °C. A thin mobile layer exists below the melting point.

13. (b) a moving skater. Sliding produces the heat.

14. Change = 0.0074 × 100. **Answer: about 0.74 °C, far too little to explain slipping at −30 °C**

15. Pressure melting: weight melts the ice (too small an effect). Frictional melting: sliding heats and melts a thin film (true for moving skates). Premelting: a liquid-like layer exists on ice below 0 °C (explains slipping even when standing still).

16. Experiments confirm a mobile surface layer and frictional melting, but how much each contributes, and the exact behaviour of the surface molecules, is still being researched.

17. 1 → (a), 2 → (d), 3 → (b), 4 → (c). Each idea matches its role in the explanation.