

Name _____

Date _____

Score: _____ / 15

30 minutes · 15 marks · calculator and data booklet allowed

- Answer all the questions.
- For each question, choose the answer you think is best and circle the letter.
- Each question is worth 1 mark.

1. The temperature of a gas rises from 27 °C to 327 °C. By what factor does the average kinetic energy of its molecules increase?

- A.** 12
- B.** 4
- C.** 2
- D.** $\sqrt{2}$

2. What is the internal energy of a solid?

- A.** the total random kinetic energy plus the total intermolecular potential energy of its molecules
- B.** the average kinetic energy of its molecules
- C.** the kinetic energy of the solid as it moves
- D.** the thermal energy given to the solid

3. A solid melts at its melting point. What happens to the average random kinetic energy and to the total intermolecular potential energy of its molecules?

- A.** kinetic energy: increases; potential energy: no change
- B.** kinetic energy: increases; potential energy: increases
- C.** kinetic energy: no change; potential energy: decreases
- D.** kinetic energy: no change; potential energy: increases

4. 8.4 kJ of thermal energy is supplied to 0.20 kg of a liquid. Its temperature rises from 20 °C to 30 °C. What is the specific heat capacity of the liquid?

- A.** 1400 J kg⁻¹ K⁻¹
- B.** 4200 J kg⁻¹ K⁻¹
- C.** 2100 J kg⁻¹ K⁻¹
- D.** 4.2 J kg⁻¹ K⁻¹

5. 0.10 kg of water at 80 °C is mixed with 0.30 kg of water at 20 °C. No energy is lost. What is the final temperature?

- A. 50 °C
 - B. 65 °C
 - C. 35 °C
 - D. 40 °C
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6. Blocks X and Y have the same mass. They receive the same amount of thermal energy. The temperature rise of X is three times the temperature rise of Y. What is (specific heat capacity of X)/(specific heat capacity of Y)?

- A. 3
 - B. 1/9
 - C. 9
 - D. 1/3
-

7. A heater of power P melts a solid of mass m at its melting point in a time t. No energy is lost. What is the specific latent heat of fusion of the solid?

- A. Pt/m
 - B. $P/(mt)$
 - C. mt/P
 - D. Pm/t
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8. Why does a burn from steam at 100 °C cause more damage than a burn from the same mass of water at 100 °C?

- A. The steam is at a higher temperature than the water.
 - B. The steam releases its latent heat as it condenses on the skin.
 - C. Steam has a larger specific heat capacity than water.
 - D. The molecules of steam have a larger average kinetic energy.
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9. How much energy is needed to change 0.50 kg of ice at 0 °C into water at 20 °C? (Specific latent heat of fusion of ice = 334 kJ kg⁻¹; specific heat capacity of water = 4200 J kg⁻¹ K⁻¹.)

- A. 1.7×10^5 J
 - B. 4.2×10^4 J
 - C. 1.3×10^5 J
 - D. 2.1×10^5 J
-

10. Air above a radiator moves upwards. What is the reason?

- A.** Thermal energy always rises.
 - B.** The warm air molecules become lighter.
 - C.** The warm air expands and becomes less dense than the air around it.
 - D.** The radiator emits radiation upwards.
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11. A metal rod conducts thermal energy at a rate P . It is replaced by a rod of the same metal with twice the diameter and twice the length. The temperature difference between the ends is the same. What is the new rate?

- A.** $2P$
 - B.** P
 - C.** $4P$
 - D.** $P/2$
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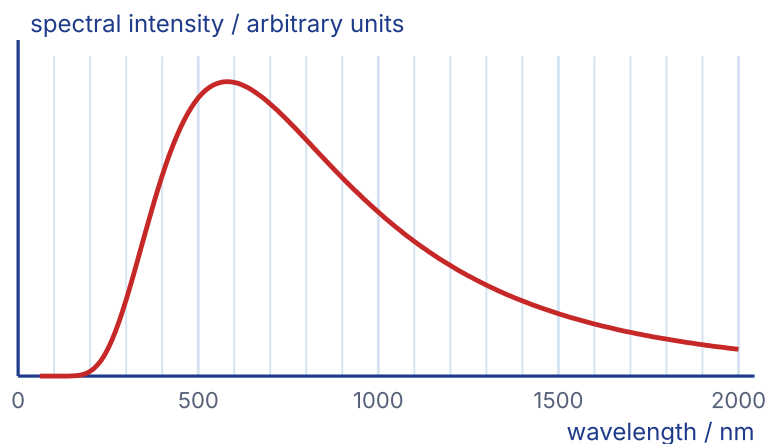
12. A glass window has an area of 2.0 m^2 and a thickness of 4.0 mm . The thermal conductivity of the glass is $0.80 \text{ W m}^{-1} \text{ K}^{-1}$. The temperature difference between the two faces is 10 K . What is the rate of thermal energy transfer through the glass?

- A.** 4.0 W
 - B.** 4000 W
 - C.** 16 W
 - D.** 2000 W
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13. A black body radiates a power P . Its kelvin temperature is doubled and its radius is halved. What is the new power radiated?

- A.** $8P$
 - B.** $2P$
 - C.** $16P$
 - D.** $4P$
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14. The graph shows the spectrum of radiation emitted by a black body. What is the surface temperature of the body?



- A.** 2.0×10^{-4} K
- B.** 5.0×10^{-6} K
- C.** 5.0×10^3 K
- D.** 1.2×10^3 K

15. Star X has luminosity L and is at a distance d from Earth. Its apparent brightness is b . Star Y has luminosity $9L$ and is at a distance $3d$ from Earth. What is the apparent brightness of Y?

- A.** $3b$
 - B.** b
 - C.** $b/3$
 - D.** $9b$
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