مراجعة Transfer Heat ,Energy Thermal وغيرها للامتحان النهائي منهج انسباير Inspire

المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة فيزياء في الفصل الثاني

1	ملخص وتدريبات الوحدة 12 حالات المادة Matter of States باللغتين العربية والانجليزية
2	ملخص وتدريبات الوحدة 11 الطاقة الحرارية Energy Thermal باللغتين العربية والانجليزية
3	ملف مراجعة نهائية وحدة Energy Thermal ووحدة Matter of States وفق الهيكل منهج انسباير Inspire
4	تجميعة أسئلة اختبارات وزارية سابقة القسم الخامس
5	تجميعة أسئلة اختبارات وزارية سابقة القسم الرابع

Grade 12 Advanced Physics – Term 2
Revision-1 Questions (Night-Before-Exam Pack)

Topics: Thermal Energy & Heat Transfer • States of Matter • Gas Laws • Expansion • Calorimetry • Thermodynamics

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Student Name	

Whenever necessary, use the following physical formulas. كلما كان ذلك ضرورياً ، استخدم الصيغ الفيزيائية التالية	
Thermal Energy	States of mater
T(K) = T(°C) + 273 $\Delta E = Q = mC\Delta T = mC(T_f - T_i)$ $Q = \pm mH_f$ $Q = \pm mH_v$ $\Delta U = Q - W$ $\Delta S = \frac{Q}{T}$ $Q_{lost} = -\ Q_{gained}$	$P = \frac{F}{A}$ $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $P\,V = nRT$ $\alpha = \frac{\Delta L}{L_1\Delta T}$ $\beta = \frac{\Delta V}{V_1\Delta T}$
$g = 9.8\ m/s^2$	$R = 8.31$ Pa.m³/(mol.K)

Table 2 Heats of Fusion and Vaporization of Common Substances

Material	Heat of Fusion H_f (J/kg)	Heat of Vaporization H_v (J/kg)
Copper	2.05×10^5	5.07×10^6
Mercury	1.15×10^4	2.72×10^5
Gold	6.30×10^4	1.64×10^6
Methanol	1.09×10^5	8.78×10^5
Iron	2.66×10^5	6.29×10^6
Silver	1.04×10^5	2.36×10^6
Lead	2.04×10^4	8.64×10^5
Water (ice)	3.34×10^5	2.26×10^6

Table 1 Specific Heat of Common Substances

Material	Specific Heat (J/(kg·K))	Material	Specific Heat (J/(kg·K))
Aluminum	897	Lead	130
Brass	376	Methanol	2450
Carbon	710	Silver	235
Copper	385	Water Vapor	2020
Glass	840	Water	4180
Ice	2060	Zinc	388
Iron	450		

Part 1 – Multiple Choice (Choose ONE correct answer)

1) Which statement best explains why ice floats on liquid water?

A) Ice has greater mass than water.

B) Ice is less dense because water expands when it freezes.

C) Ice absorbs heat from water and becomes lighter.

D) Heat transfer stops at 0°C.

2) The temperature 40 K is equal to:

A) 313°C

B) -233°C

C) -40°C

D) 233°C

3) Which heat-transfer method can occur through empty space?

A) Conduction

B) Convection

C) Radiation

D) Melting

4) Equal-mass blocks start at the same temperature and are placed in a warm room. Which warms up fastest?

A) The one with the largest specific heat

B) The one with the smallest specific heat

C) They warm at the same rate

D) The densest material warms fastest

5) A substance is melting at its melting point. What happens to its temperature while melting continues?

A) Increases

B) Decreases

C) Stays constant

D) Oscillates up and down

6) A heating curve shows a flat segment at 0°C. This flat segment represents:

A) Cooling of water

B) Melting (phase change)

C) Heating of liquid water

D) Heating of steam

7) During a process, 600 J of heat is added to a system and 250 J of work is done ON the system. The change in internal energy is:

A) 350 J

B) 600 J

C) 250 J

D) 850 J

8) A heat engine absorbs 820 J from the hot reservoir and rejects 530 J to the cold reservoir. Its efficiency is closest to:

A) 35%

B) 65%

C) 155%

D) 45%

9) Which statement about entropy is correct?

A) Freezing increases entropy of the water molecules.

B) Freezing decreases entropy and releases energy to surroundings.

C) Melting decreases entropy and releases energy.

D) Entropy is the same in all states of matter.

10) A 1.2 kg object rests on a surface. It touches the surface over an area of 0.020 m^2. What pressure does it apply? (g = 9.8 m/s^2)

A) 588 Pa

B) 24 Pa

C) 0.24 Pa

D) 1176 Pa

11) A gas is compressed at constant temperature. Which law describes the inverse relationship between pressure and volume?

A) Charles's law

B) Boyle's law

C) Gay-Lussac's law

D) Avogadro's law

12) Which feature mainly distinguishes plasma from a normal gas?

A) It is always cold

B) It is electrically conductive (ionized)

C) It has fixed volume

D) It cannot flow

13) When a glass tube is placed into mercury, the mercury level in the tube is depressed because:

A) Adhesion > cohesion

B) Cohesion > adhesion

C) Mercury has zero surface tension

D) Mercury evaporates quickly

14) Why does high humidity make you feel hotter at the same air temperature?

A) Sweat evaporates faster

B) Sweat evaporates slower, so cooling is reduced

C) Air conducts heat much better

D) Your body stops sweating

15) A circular hole is punched in a metal sheet. If the sheet is heated uniformly, the hole will:

A) Shrink

B) Expand

C) Stay the same size

D) Expand then shrink

Part 2 – Short Answer (Write a brief explanation)

1) Describe (in words) what happens to the direction of heat transfer when a hot metal spoon is placed into cold tea until thermal equilibrium is reached.

2) Explain why temperature is constant during boiling and melting even though heat is still being added.

3) A student says: “Convection cannot happen in a solid.” Explain why this is true.

4) Explain why a cast-iron pan is good for cooking, linking your explanation to specific heat and thermal mass.

5) Explain why using Kelvin is required in gas-law calculations.

6) A sealed syringe containing air is heated while the plunger is locked (constant volume). Explain what happens to pressure and why.

Part 3 – Calculations (Show all steps)

1) Calorimetry: A metal pan absorbs 1.2×10^5 J and warms from 295 K to 360 K. If its specific heat is 460 J/(kg·K), find its mass.

Answer: _____

2) Mixing water: 0.70 kg of water at 20.0°C is mixed with 0.50 kg of water at 90.0°C in an insulated container. Find the final equilibrium temperature.

Answer: _____

3) Water + alcohol mixing: After the water in Question 2 reaches equilibrium, 0.40 kg of ethanol (c = 2440 J/(kg·K)) at 22.0°C is added. Assume no heat loss. Calculate the final temperature.

Answer: _____

4) Phase change: How much thermal energy is required to change 80.0 g of ice at -10.0°C into water at 15.0°C? (Use: c_ice = 2100 J/(kg·K), c_water = 4186 J/(kg·K), L_f = 3.34×10^5 J/kg)

Answer: _____

5) Gas laws (combined): A gas has volume 18.0 L at 100 kPa and 290 K. It is changed to 140 kPa and 360 K. Find the new volume.

Answer: _____

6 A copper ring has a circumference (or length) of $L_0 = 12.0$ cmat 20°C. Find its circumference at 220°C.
(Use the **linear expansion coefficient** for copper: (α=1.7×10−5 °C^{-1}).

If the ring has a small gap (a slit) at 20°C, what will happen to the gap when the ring is heated to 220°C? Explain briefly.

Answer: _____

End of Revision-1 Pack

Revision -2

Instructions: Answer all questions. Show clear working for numerical parts. Assume no heat loss unless stated. Use c_water = 4186 J/(kg·K) if needed.

Part 1: Multiple Choice (15)

1. Which expression correctly represents the heat absorbed when a substance warms up without changing phase?

A) $Q = mc\Delta T$
B) $Q = mL$
C) $Q = c\Delta T$
D) $Q = m/(c\Delta T)$

2. In an insulated calorimetry experiment, which statement is correct?

A) Heat lost by the hotter object equals heat gained by the cooler object.
B) Both objects gain heat.
C) Both objects lose heat.
D) Heat gained is always larger than heat lost.

3. A material has a large specific heat capacity. For the same mass and same energy input, its temperature change will be:

A) Large
B) Small
C) Zero
D) Undefined

4. Which unit is correct for specific heat capacity?

A) J/(kg·K)
B) J/kg
C) K/J
D) kg·K/J

5. When ice at 0°C melts into water at 0°C, the energy involved is best described as:

A) Sensible heat
B) Latent heat of fusion
C) Latent heat of vaporization
D) Thermal conductivity

6. If a gas expands at constant pressure, the work done by the gas is:

A) $W = P\Delta V$
B) $W = V\Delta P$
C) $W = \Delta P/\Delta V$
D) $W = P/V$

7. On a P–V diagram, the work done by a gas during a process equals:

A) The slope of the curve
B) The area under the curve
C) The final pressure only
D) The change in temperature only

8. Which process occurs at constant temperature for an ideal gas?

A) Isochoric
B) Isothermal
C) Isobaric
D) Adiabatic

9. For an ideal gas, if temperature stays constant and pressure increases, the volume will:

A) Increase
B) Decrease
C) Stay the same
D) Become zero

10. Heat transfer through direct contact between particles is called:

A) Convection
B) Radiation
C) Conduction
D) Evaporation

11. Which statement about thermal conductivity is correct?

A) Metals generally conduct heat better than wood.
B) Wood generally conducts heat better than metals.
C) All materials conduct heat equally.
D) Thermal conductivity depends only on mass.

12. A rod is heated uniformly. Its linear expansion depends on:

A) Only the initial length
B) Only the temperature change
C) Initial length and temperature change
D) Only the final temperature

13. If a metal ring is heated uniformly, a small gap (slit) in the ring will:

A) Increase
B) Decrease
C) Stay the same
D) Disappear instantly

14. The first law of thermodynamics is best written as:

A) $\Delta U = Q - W$
B) $\Delta U = W - Q$
C) $Q = W - \Delta U$
D) $W = \Delta U - Q$

15. In an adiabatic process, the heat exchanged with the surroundings is:

A) Positive
B) Negative
C) Zero
D) Always constant

Part 2: Numerical Questions (5)

1) Calorimetry - heating a solid

A metal block absorbs 9.0×10^4 J of energy and its temperature rises from 18°C to 78°C. The block has mass 2.5 kg.

(a) Calculate the temperature change ΔT in kelvin.

Answer: _____

(b) Calculate the specific heat capacity of the metal.

Answer: _____

(c) Short conclusion: Based on your value of c, is the metal more likely to behave like a 'good heat storage' material (high c) or a 'fast temperature change' material (low c)? Explain in one sentence.

Answer: _____

2) Mixing problem + inference

0.60 kg of water at 90°C is poured into 0.40 kg of water at 20°C in an insulated container.

(a) Write the energy balance equation using Q_hot = Q_cold.

Answer: _____

(b) Calculate the final equilibrium temperature.

Answer: _____

(c) Short inference: Is the final temperature closer to 90°C or 20°C? Explain why using mass and specific heat (one sentence).

Answer: _____

3) Latent heat + energy reasoning

A student adds 3.0×10^4 J of energy to 0.20 kg of ice at 0°C. The latent heat of fusion of ice is 3.34×10^5 J/kg.

(a) Calculate the mass of ice that melts.

Answer: _____

(b) How much ice (if any) remains unmelted?

Answer: _____

(c) Short conclusion: Does the temperature rise above 0°C during melting? Answer 'Yes' or 'No' and explain why (one sentence).

Answer: _____

4) Linear expansion (no area) + gap question

A steel rail is 12.0 m long at 15°C. It is heated to 55°C. Use α_steel = 1.2×10^-5 °C^-1.

(a) Calculate the change in temperature ΔT.

Answer: _____

(b) Calculate the increase in length ΔL.

Answer: _____

(c) Calculate the final length of the rail.

Answer: _____

(d) Short inference: If two rails meet with a small gap at 15°C, what happens to the gap when temperature increases? Explain briefly.

Answer: _____

5) Gas laws + PV work (multi-branch)

An ideal gas in a cylinder expands from 2.0 L to 5.0 L at a constant pressure of 1.5×10^5 Pa. Assume 1 L = 1.0×10^-3 m^3.

(a) Convert the initial and final volumes to m^3.

Answer: _____

(b) Calculate the work done by the gas.

Answer: _____

(c) If 6.0×10^2 J of heat is added during this expansion, calculate the change in internal energy ΔU using the first law.

Answer: _____

(d) Short conclusion: During this process, does internal energy increase or decrease? Answer and justify using your sign of ΔU.

Answer: _____

End of revision-2 questions.