FUKIEN SECONDARY SCHOOL

S4 First Term Uniform Test (2020-2020)

Physics

(1 hour)

Date: 20th October 2020 Name: _____

Time: 10:15a.m. – 11:15a.m. Class: _____ No.: _____

Instructions to students:

1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 60.
6. The paper consists of two sections: Section A Multiple Choice Questions (20 marks) and Section B Structured Questions (40 marks).
7. You may use the following data and formulas.

Specific heat capacity of water	4200 J $kg^{-1}°C^{-1}$	Energy transfer during heating and cooling	$E = mc\,\Delta T$
Specific heat capacity of ice	2100 J kg^{-1} $°C^{-1}$	Energy transfer during change of state	$E = l\,\Delta m$
Specific latent heat of fusion of ice	3.34×10^5 J kg^{-1}		
specific heat capacity of steam	2000 J kg^{-1} $°C^{-1}$		
specific latent heat of vaporization of water	2.26×10^6 J kg^{-1}		

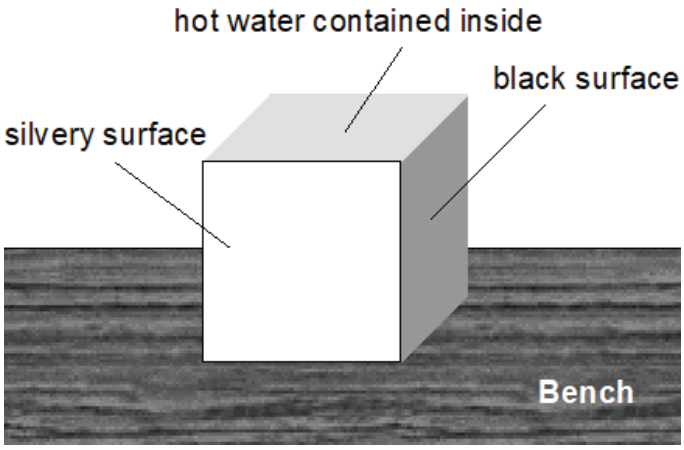
Section A: Multiple Choice Questions (20 marks)

1. Metal blocks *P* and *Q* are of the same initial temperature. The ratio of the mass of *P* to that of *Q* is 2 : 1. The ratio of the heat capacity of *P* to that of *Q* is 1 : 3. If both blocks absorb the same amount of energy and are then put into good thermal contact, which of the following statements about the heat flow between the two blocks is correct? Assume no energy is lost to the surroundings.
   A. Heat will flow from *P* to *Q*.
   B. Heat will flow from *Q* to *P*.
   C. Heat will first flow from *P* to *Q*, and then *Q* to *P*.
   D. No heat will flow between the two blocks.

2. A resistor has resistance of 2 Ω at -20 °C and 10 Ω at the steam point. What is the temperature when its resistance is 5 Ω?

   A. 25 °C
   B. 35 °C
   C. 45 °C
   D. 55 °C

3. The figure below shows a cubic container with hot water inside. Among the six surfaces of the container, one of them is painted with a black colour and one of them is painted with a silver colour. It is put on a bench to cool for a long time.



Which of the following statements about the cooling process is/are correct?

(1) The temperature of the water near the black surface will be lower than that of the water near the silvery surface after a long time.

(2) The rate of heat loss to the surroundings due to radiation is higher on the black surface than that on the silvery surface.

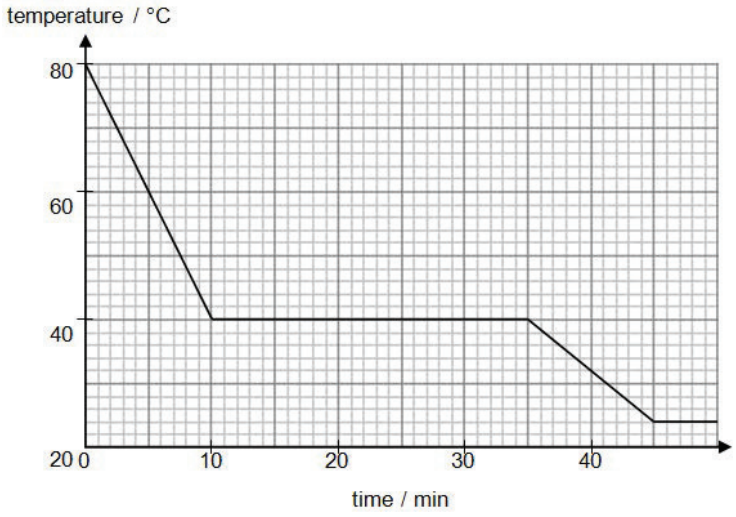
(3) The temperature of the water near the black surface will be higher than that of the water near the silvery surface after a long time.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

4. Which of the following statements is correct?
   A. Temperature measures the energy transferred from one object to another when the objects are in contact.
   B. Heat is the energy transferred from one body to another as a result of a temperature difference between the bodies.
   C. Internal energy is the energy gained by an object as a result of heat flow.
   D. The unit of temperature, heat and internal energy is the same.

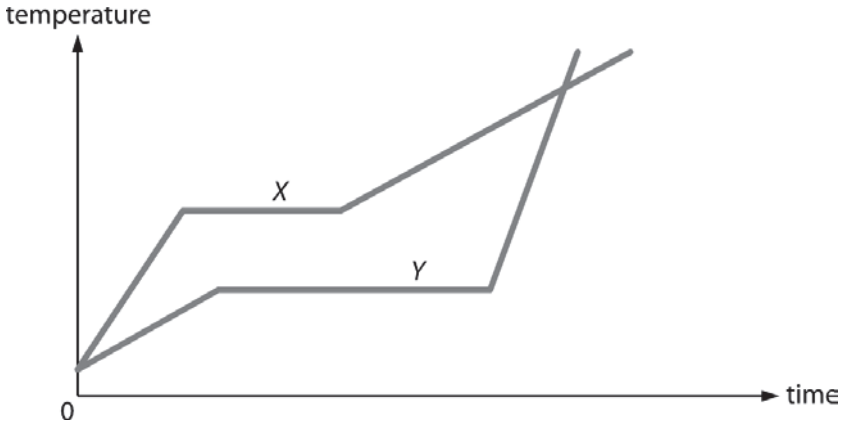
5. Substances in solid state generally conduct heat better than those in gaseous state. This is because
   A. there are no free electrons in gaseous substances.
   B. the intermolecular forces in solids are generally stronger than that in gases.
   C. the molecules in gases move faster.
   D. the molecules in gases have higher kinetic energy.

6. A gas substance is cooled under room temperature. Its cooling curve is as shown below. The specific heat capacity of the gas is 2500 J kg^{-1} $°C^{-1}$. If the rate of energy loss of the substance is constant throughout the cooling process, what is the specific latent heat of vaporization of the substance?



   A. 75 kJ kg^{-1}
   B. 100 kJ kg^{-1}
   C. 250 kJ kg^{-1}
   D. 300 kJ kg^{-1}

7. Substances *X* and *Y* of the same mass are heated at the same rate. The graphs below show their temperature–time graphs. Initially, they are in solid state. Which of the following physical quantities of substance *X* are higher than that of substance *Y* according to the graph?



A. The specific latent heat of fusion and the specific heat capacity in solid state
B. The specific latent heat of fusion and the specific heat capacity in liquid state
C. The melting point and the specific heat capacity in solid state
D. The melting point and the specific heat capacity in liquid state

8. Liquid *X* of mass 2 kg is heated by an immersion heater for 10 minutes. The temperature of *X* is raised from 20 °C to 30 °C. 1000 J of energy is lost to the surroundings in the process. The power of the heater is 100 W. Calculate the specific heat capacity of *X*.

A. 2950 J kg^{-1} $°C^{-1}$
B. 3000 J kg^{-1} $°C^{-1}$
C. 3050 J kg^{-1} $°C^{-1}$
D. 5900 J kg^{-1} $°C^{-1}$

9. A student mixes 0.39 kg of water and 0.01 kg of ice, both at 0 °C, in a container. Then, she transfers a metal sphere of 0.1 kg at 89.3 °C into the container and stirs the mixture. If the mixture reaches equilibrium at 2 °C, what is the energy released by the metal sphere? (Given: specific heat capacity of copper = 385 J kg^{-1}

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