

FIZIK

TINGKATAN 4

BAB 4

HABA

SKEMA

MODUL

CEMERLANG

KERTAS 1

1	C	6	A
2	A	7	C
3	C	8	A
4	B	9	B
5	C	10	B

KERTAS 2

BAHAGIAN A.

SOALAN NO 1 [4 markah].

1. (a) (i) *Mercury / Alcohol*
Merkuri / Alkohol [1m]
- (ii) *It expands and contracts uniformly.*
Cecair itu mengembang dan mengecut dengan seragam. [1m]
- (b) (i)

√

 stops expanding.
berhenti mengembang [1m]
- (ii) *Thermal equilibrium*
Keseimbangan terma [1m]

SOALAN NO 2 [5 markah]

1. (a) (i) Expansion of the mercury/Increase in the volume of the mercury when the temperature increases.
Pengembangan merkuri/Pertambahan isi padu merkuri apabila suhu bertambah.

[1m]

- (ii) It is opaque so can be seen easily/Good heat conductor/Uniform expansion / Does not stick to the glass wall of the thermometer.
Ia adalah legap maka boleh dilihat dengan mudah/konduktor haba yang baik/ pengembangan seragam /tidak melekat pada dinding kaca termometer.

- (b) (i) $22.6 \text{ cm} - 2.6 \text{ cm} = 20.0 \text{ cm}$

[1m]

- (ii) Temperature of hot oil / *Suhu minyak panas*

$$= \frac{(16.9 - 2.6)}{20} \times 100^\circ\text{C} = 71.5^\circ\text{C}$$

[2m]

2. (a) (i) $0\text{K} / -273\text{ }^{\circ}\text{C}$

[1m]

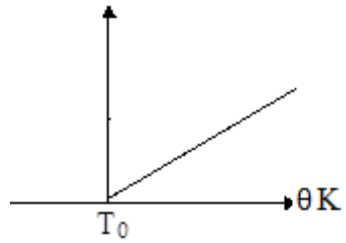
(ii) Absolute zero/ sifar mutlak

[1m]

(b) Pressure law / hukum tekanan

[1m]

(c) $P\text{ (Pa)}$



[2m]

SOALAN NO 4 [7 markah]

1. (a) Latent heat of vaporisation
Haba pendam pengewapan

[1m]

(b) (i)	Increases <i>Meningkat</i>	
	Decreases <i>Berkurang</i>	
	Unchange <i>Tidak berubah</i>	✓

[1m]

- (ii) To form the bonding between the molecules\
Membentuk ikatan antara molekul

[1m]

- (c) **M1 : State correct equation**

$$Q_3 + Q_4 = mc\theta + mL_f$$

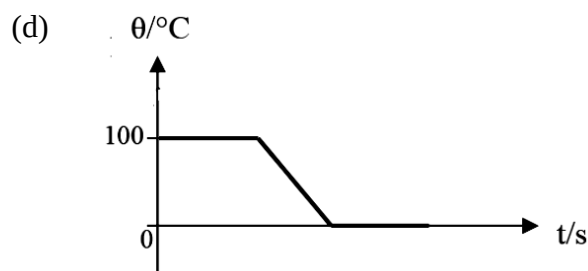
M2 : Subtitution

$$= 0.1(4200)(100 - 0) + 0.1(3.36 \times 10^5)$$

M3 : Answer with correct unit

$$= 75\,600\text{ J}$$

[3m]



[1m]

SOALAN NO 5 – Tingkatan 4 [8 markah]

1. (a) Air pressure
Tekanan udara [1m]
- (b) (i) The reading of Bourdon gauge in Diagram 2 is higher than that in Diagram 1
Bacaan tolok Bourdon pada Rajah 2 lebih tinggi daripada pada Rajah 1 [1m]
- (ii) The reading of the thermometer in Diagram 2 is higher than that in Diagram 1
Bacaan termometer pada Rajah 2 lebih tinggi daripada pada Rajah 1 [1m]
- (iii) As the heat increases, the temperature increases
Semakin bertambah haba, semakin meningkat suhu [1m]
- (iv) As the temperature increases, the air pressure in flask increases
Semakin meningkat suhu, semakin tinggi tekanan udara dalam kelalang [1m]
- (c) When the molecules received heat, it will move faster
Apabila molekul-molekul menerima haba, ia akan bergerak lebih pantas
- This will lead to an increase of kinetic energy of the air molecules
Ini membawa kepada peningkatan tenaga kinetik dalam molekul-molekul udara
- The collision between the molecules become more often
Pelanggaran antara molekul-molekul menjadi lebih kerap [2m]
- (d) Pressure law
Hukum tekanan [1m]

SOALAN NO 8 – Tingkatan5/4 [12 markah]

1. (a) The amount of energy/heat absorbed to increase the temperature of 1 kg of substance by 1°C.
Jumlah tenaga/haba yang diserap untuk meningkatkan suhu bagi 1 kg bahan sebanyak 1°C. [1m]
 - (b) (i) Dark surface
Permukaan gelap [1m]
 To absorb heat better
Menyerap haba lebih baik [1m]
 - (ii) Low specific heat capacity
Muatan haba tentu rendah [1m]
 To experience a higher temperature rise
Mengalami kenaikan suhu yang lebih tinggi [1m]
 - (c) Model B
 Dark surface / Low specific heat capacity
Permukaan gelap / Muatan haba tentu rendah [2m]
 - (d) (i) $t = 25 \times 60 = 1\,500\text{ s}$
 $E = Pt$
 $= 16 \times 1\,500$
 $= 24\,000\text{ J}$
 - (ii) $\theta = \frac{E}{mc}$
 $= \frac{24\,000}{0.5 \times 4\,200}$
 $= 11.43^\circ\text{C}$
- (i) [3m] (ii) [2m]

2. (a) The quantity of heat needed to increase the temperature of 1 kg of the substance by 1°C.
Kuantiti haba yang diperlukan untuk menaikkan suhu bagi 1 kg bahan sebanyak 1°C. [1m]
- (b) (i) The material is copper.
 This is because copper have low specific heat capacity.
Bahan itu adalah kuprum.
Ini kerana kuprum mempunyai muatan haba tentu yang rendah. [2m]
- (ii) The material is polymer.
 This is because polymer have high specific heat capacity.
Bahan adalah polimer. Ini kerana polimer mempunyai muatan haba tentu yang tinggi. [2m]
- (iii) Lower mass
 It is easy to handle.
Jisim yang kecil.
Mudah dikendalikan. [2m]
- (c) (i) $Pt = mc\theta$
 $t = \frac{mc\theta}{P}$
 $= \frac{3.5 \times 900 \times 90}{800}$
 $= 354.4 \text{ s}$ [2m]
- (ii) $Pt = mc\theta$
 $t = \frac{mc\theta}{P}$
 $= \frac{2.5 \times 390 \times 90}{800}$
 $= 109.7 \text{ s}$ [2m]
- (d) The most suitable is copper pot.
Paling sesuai ialah periuk kuprum. [1m]

KERTAS 2

BAHAGIAN B

SOALAN NO 9 – Tingkatan 5 [20 markah]

1. (a) (i) Force per unit area exerted on an object.
Daya per unit luas yang dikenakan pada suatu objek. [1m]
- (ii)
- When the volume is bigger
Apabila isi padu lebih besar
 - the pressure is lower
tekanan lebih rendah
 - the temperature remains constant
suhu kekal malar
 - When the pressure increases, the volume decreases, with the temperature unchanged.
Apabila tekanan meningkat, isi padu berkurang, dengan suhu tidak berubah.
 - Boyle's law.
Hukum Boyle.
- [5m]
- (b)
- The pressure on its body decreases
Isi padu pada badan berkurang
 - as the depth decreases
apabila kedalaman berkurang
 - because pressure is proportional to depth
kerana tekanan berkadaran dengan kedalaman
 - According to Boyle's law, when the pressure decreases the volume increases.
Mengikut hukum Boyle, apabila tekanan berkurang, isi padu bertambah.
- [4m]
- (c)
- The cover must be transparent
Tudung mestilah lut sinar
 - so that sunlight can penetrate easily;
supaya cahaya matahari boleh menembusi dengan mudah;
 - The specific heat capacity of the pan is small
Muatan haba tentu kualiti kecil
 - so that it is easily heated up with a small amount of heat energy;
supaya lebih mudah dipanaskan dengan jumlah tenaga haba yang kecil;
 - The colour of the pan must be black
Warna kualiti mestilah hitam
 - so that it can absorb more heat;
supaya dapat menyerap lebih banyak haba;
 - The specific heat capacity of the body must be big
Muatan haba tentu badan mestilah besar
 - so that heat is not easily lost to the surrounding;
supaya haba tidak mudah hilang ke persekitaran;
 - The body must be able to tilt easily

- Badan mestilah boleh dicondongkan dengan mudah*
- to face the direction of the sun to get maximum heating.
untuk menghadap arah matahari bagi mendapatkan pemanasan yang maksimum.

[10m]

2. (a) Thermal equilibrium

[1m]

- (b)
- The amount of heat energy is the same
 - c of Diagram 9.1(a) is greater than Diagram 9.1(b)
 - Temperature in diagram 9.1(a) is greater than in Diagram 9.1(b)
 - The rate of heat loss in Diagram 9.1(b) is greater than in Diagram 9.1(a)

The smaller the c of container, the greater the rate of heat loss

[5m]

- (c)
- Initially, more heat flow from water to the container than from container to the water
 - nett heat flow is from water to the containers
 - when thermal equilibrium is reached nett heat flow is zero

the temperature of water = temperature of container (a) are the same.

Explain how it happens.

[4m]

(d)

CHARACTERISTICS	REASON
High specific capacity of inner box	Small change in temperature // keep hot longer time.
Material X made of good heat insulator	prevent heat from flow out
Low density of material X	Low mass // light
Low density of outer box	Low mass // light
Shiny colour of outer box	Reflect heat from outside

[10m]

3. **Spm 2017**

- (a) Heat is a form of energy which is transferred from a hot to a cold body.
haba ialah satu bentuk tenaga yang berpindah dari suatu jasad panas ke suatu jasad sejuk.
- (b) (i)
 - the mass of water in P is smaller than the mass of water in Q
jisim air dalam P adalah lebih kecil daripada jisim air dalam Q
 - The heat supplied to P and Q are the same
haba yang dibekalkan kepada P dan Q adalah sama
 - The rise of temperature of the water in P is higher than the rise of temperature of water in Q
kenaikan suhu air dalam P adalah lebih tinggi daripada kenaikan suhu air dalam Q
- (ii) when the mass of water decrease, the rise of temperature of water increase
apabila jisim air berkurangan, kenaikan suhu air bertambah
- (iii) Heat supplied
haba yang dibekalkan
- (c)
 - ✓ The temperature of lemonade is higher than the temperature of ice cubes
suhu air lemon adalah lebih tinggi daripada suhu ketulan ais
 - ✓ Heat flows from lemonade to ice cubes and from ice cubes to lemonade
haba mengalir dari air lemon ke ketulan ais dan dari ketulan ais ke air lemon
 - ✓ Heat flows from ice cube to lemonade at slower rate
haba mengalir dari ketulan ais ke air lemon pada kadar yang perlahan
 - ✓ The temperature of lemonade decrease while the temperature of ice cubes increase.
suhu bagi air lemon berkurangan manakala suhu bagi ketulan ais bertambah
- (d)
 - ✓ Use a polystyrene cup to reduce the heat loss to the surrounding because polystyrene is a heat insulator
gunakan sebuah cawan polisterina untuk mengurangkan kehilangan haba ke persekitaran kerana polisterina ialah penebat haba
 - ✓ Use a material with high melting point so that the cup will not melt easily
menggunakan suatu bahan dengan takat lebur yang tinggi supaya cawan itu tidak mudah lebur
 - ✓ Use a material with high specific heat capacity so that the cup is not heated easily
menggunakan bahan dengan muatan haba tentu yang tinggi supaya cawan tidak mudah dipanaskan
 - ✓ Use a white or silver colour cup to reduce heat loss through radiation

gunakan cawan berwarna putih atau perak untuk mengurangkan kehilangan haba melalui sinaran

- ✓ Use a plastic lid to reduce heat loss through conduction
gunakan penutup plastic untuk mengurangkan kehilangan haba melalui konduksi
- ✓ Cover the cup with cloth / tissue / felt so that the layer of air can be trapped. This layer of air reduce the heat loss
tutup cawan dengan kain/ kertas tisu/ kain bulu supaya satu lapisan udara boleh terperangkap. Lapisan udara ini akan mengurangkan kehilangan haba.

KERTAS 2

BAHAGIAN C

SOALAN NO 11 – Tingkatan 5 [20 markah]

1. (a) (i) *Amount of heat required to boil one unit mass of liquid to gas at its boiling point, without change in temperature* [1m]
- (ii) Heat from the heater transfers to the water
Water changes to steam
Steam condenses on food
Steam transfers high latent heat to food [4m]
- (b) (i) $E = (0.50)(4200)(100-25)$
 $= 157\,500\text{ J}$ [2m]
- (ii) $m = \frac{450 \times 10^3}{2.3 \times 10^6}$
 $= 0.1957\text{ kg}$ [2m]
- (iii) No heat loss to the surrounding [1m]
- (c)
 - Low thermal conductivity
As heat insulator// prevent heat loss/ heat gain
 - High specific heat capacity
Not easy to be heat up/cool down /Remain the temperature of the pouch
 - Low density
Light
 - Aluminium foil
Reflects heat back to the food// help transfer escaped heat back to the food//contains the heat within the cooler bag as long as it remains closed// Metallic
 - Material P
 - cooler bag with low thermal conductivity, high specific heat capacity, low density, aluminium foil as inner lining [10m]

2. (a) (i) Thermal equilibrium means two bodies which are in contact are at the same temperature and the net transfer of heat between the two bodies is zero.
Keseimbangan terma bermakna dua jasad yang bersentuhan mempunyai suhu yang sama dan pemindahan haba bersih antara dua jasad itu adalah sifar.

[1m]

- (ii)
- The temperature of the boiling water is higher than the temperature of the thermometer.
Suhu air mendidih adalah lebih tinggi daripada suhu termometer.
 - Hence, heat flows from the boiling water to the thermometer until they achieve thermal equilibrium
Maka, haba mengalir dari air mendidih ke termometer sehingga mencapai keseimbangan terma.
 - The temperature of the boiling water is the same as the temperature of the thermometer.
Suhu air mendidih adalah sama dengan suhu termometer.
 - No net heat flows at 100 °C
Tiada aliran haba bersih pada 100 °C

[4m]

- (b) (i) Heat released by M = Heat absorbed by water
Haba yang dibebaskan oleh M = Haba yang diserap oleh air

$$500 \times 800 \times (100 - \theta) = 200 \times 4200 \times (\theta - 30)$$

$$4000 - 40\theta = 84\theta - 2520$$

$$\theta = 52.6^{\circ}\text{C}$$

[4m]

- (ii) Assumption – No heat is lost to the surroundings or absorbed by the polystyrene cup.
Andaian – Tiada haba yang hilang ke persekitaran atau diserap oleh cawan polisterina.

- (c)
1. Stopper must be made of hollow plastic
Penutup harus dibuat daripada plastik berongga
 2. Can trap air/
Boleh memerangkap udara
 As plastic and air are poor heat conductors, less heat is lost through the stopper.
Sebab plastik dan udara adalah konduktor haba yang lemah, kurang haba hilang melalui penutup.
 3. Space P is a vacuum
Ruang P adalah vakum
 4. So that heat from the hot drink cannot pass through the vacuum to the outside of the flask by conduction or convection.
Supaya haba daripada minuman panas tidak dapat melalui vakum ke luar kelalang melalui pengkonduksian atau perolakan.
 5. The double-walled tube is made of glass,
Tiub dinding dua lapis dibuat oleh kaca
 6. as glass is a bad conductor of heat and will reduce the rate of heat loss to the outside.

kaca adalah konduktor haba yang tidak baik, akan mengurangkan kadar kehilangan haba keluar

7. The double-walled tube is coated with a shiny paint
Tiub dinding dua lapis disalut dengan cat berkilat
8. as a shiny surface reflects heat from the wall of the thermos flask.
sebab permukaan berkilat memantulkan haba daripada dinding kelalang termos
9. Most suitable: Thermos flask W
Paling sesuai: Kelalang termos W
10. as it has a hollow plastic stopper, a vacuum space, P, a double-walled tube made of glass which is coated with a shiny paint.
sebab penutup adalah plastik berongga, ruang P adalah vakum, tiub dinding dua lapis dibuat daripada kaca dan disalut oleh cat berkilat.