

PHÒNG GD – ĐT QUẬN TÂN PHÚ
TRƯỜNG TIH – THCS – THPT NAM ÚC

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

BẢNG ĐẶC TẢ MA TRẬN ĐỀ KIỂM TRA HỌC KÌ I NĂM HỌC 2023 – 2024

Môn kiểm tra: VẬT LÝ

Lớp: 11 Hệ: THPT

Thời gian: 70 phút (Không kể thời gian phát đề)

Number	Nội dung kiến thức	Đơn vị kiến thức	Chuẩn kiến thức kĩ năng cần kiểm tra	Số câu hỏi theo mức độ nhận thức			
				Nhận biết	Thông hiểu	Vận dụng	Vận dụng cao
1	Momentum	Newton's second law & momentum	Vận dụng: - Able to integrate Newton's second law to find the applied force from the net force, which is used to calculate the momentum required.			1	
		Elastic and inelastic collision	Vận dụng: - Able to apply the elastic and inelastic collision formula based on the law of conservation of momentum to calculate the change in momentum			1	
		Momentum definition	Nhận biết: - Able to describe momentum and the difference between elastic and inelastic collisions	1			
		Impulse as a change	Vận dụng:			1	

		in momentum	- Able to calculate the impulse as the change in momentum in a force-time graph				
		Momentum conservation	Vận dụng: - Able to apply the elastic and inelastic collision formula based on the law of conservation of momentum to predict the objects after the collision.			1	
2	Energy	Work done	Vận dụng cao: - Able to integrate Newton's second law to find the applied force in an accelerating object, which is used to calculate the momentum work done to lift the object off the ground.				1
		Power & efficiency	Nhận biết: - Able to state the power in terms of energy Thông hiểu: - Able to calculate the efficiency based on the energy input and output	1	1		
		Types of energy	Nhận biết: - Able to identify the different types of energy, including potential and kinetic energy Thông hiểu: - Able to calculate the mass of an object based on its kinetic energy with proper units.	1	1		
		Conservation of energy	Vận dụng: - Able to calculate the speed of a moving object in an isolated system using the conservation law of energy at different heights.			1	
		Energy transformation	Thông hiểu: - Able to explain at least three energy transformations in real life, between kinetic energy and potential energy.		1		

	Heat	Specific heat capacity	Nhận biết: - Able to calculate specific heat capacity of a matter knowing the other variables. Thông hiểu: - Able to use specific heat capacity to calculate the heat energy required with proper units.	1	1		
		Latent heat	Thông hiểu: - Able to distinguish the appropriate latent heat of fusion or vaporisation to calculate the heat energy required with proper units. Vận dụng: - Able to interpret the heat-energy curve to derive the heat energy and the mass of the matter with proper units.		1	1	
		Temperature	Nhận biết: - Able to read the temperature on a scale with proper significant figures. Thông hiểu: - Able to explain the accuracy of the read values compared to the true value.	1	1		
	Practical skills	Graph analysis	Thông hiểu: - Able to calculate the change in momentum using a force-time graph by using the trapezoid area formula. Vận dụng: - Able to interpret a linear graph to calculate the spring constant based on the line gradient. - Able to analyse whether the graph remains any errors.		1	1	
	SHE Investigation	SHE concepts	Thông hiểu: - Able to describe different daily uses of thermometers. Vận dụng:		1	1	

			- Able to apply the SHE key concepts (CCDIAL) to extract the information from an unfamiliar text.				
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MA TRẬN ĐỀ HKI - YEAR 11													
STT	NỘI DUNG KIẾN THỨC	ĐƠN VỊ KIẾN THỨC	CÂU HỎI THEO MỨC ĐỘ NHẬN THỨC								Tổng số câu	Tổng số câu	TỈ LỆ %
			NHẬN BIẾT		THÔNG HIỂU		VẬN DỤNG		VẬN DỤNG CAO		câu hỏi TL	câu hỏi TN	
			Câu hỏi TL (đ)	Câu hỏi TN (câu)	Câu hỏi TL (đ)	Câu hỏi TN (câu)	Câu hỏi TL (đ)	Câu hỏi TN (câu)	Câu hỏi TL (đ)	Câu hỏi TN (câu)			
1	Momentum	Newton's second law & momentum					2				1	0	3%
2		Elastic and inelastic collision					2				1	0	3%
3		Momentum definition	1								1	0	2%
4		Impulse as a change in momentum					4				1	0	7%
5		Momentum conservation					3				1	0	5%
6	Energy	Work done	1						2		2	0	5%
7		Power & efficiency	1		4						2	0	8%
8		Types of energy	3		2						2	0	8%
9		Conservation of energy					2				1	0	3%
10		Energy transformation			3						1	0	5%
11	Heat	Specific heat capacity	2		2						2	0	7%
12		Latent heat			4		2				2	0	10%
13		Temperature	4		4						2	0	13%
14	Practical skills	Graph analysis			4		2				2	0	10%
15	SHE Investigation	SHE concepts			2		4				2	0	10%
Tổng cộng											23	0	100,0%
Tỷ lệ (%)			12%		25%		21%		2%				
Tổng điểm (60 điểm)			12 điểm		25 điểm		21 điểm		2 điểm				

Part A [34 marks]

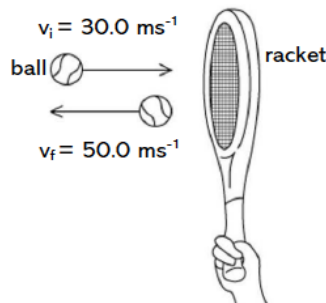
Questions to assess KA2 – application of physics concepts in new and familiar contexts

Marks are allocated for showing clear and logical working out.

Q1.

- Using Newton's 2nd law, show the steps to derive the equation: $F = \frac{\Delta p}{\Delta t}$ (2 marks)
- Explain the difference between elastic and inelastic collisions. (2 marks)

Q2. A racket hits a moving ball of mass 57.0 g, as shown in the image below:



Initially, the ball travels towards the racket at 30.0 ms^{-1} to the right.

- Show that the ball's initial momentum is 1.71 kg ms^{-1} right. (1 mark)
- The racket hits the ball, and then the ball moves at 50.0 ms^{-1} to the left. Calculate the ball's change in momentum (impulse). (2 marks)

Q3. A ball of plasticine rolls along and hits a stationary solid ball, as shown below:

Ball 1 has mass $m_1 = 0.1 \text{ kg}$ and Ball 2 has mass, $m_2 = 0.3 \text{ kg}$



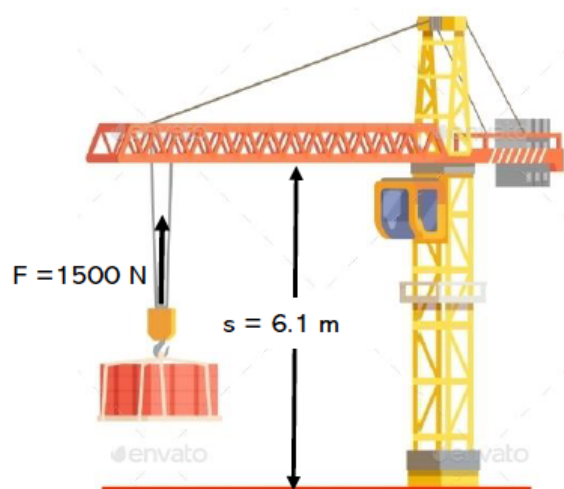
The total initial momentum of the 2 balls is 0.5 kg ms^{-1} to the right.

After the collision, ball 1 and ball 2 stick together, as shown below:



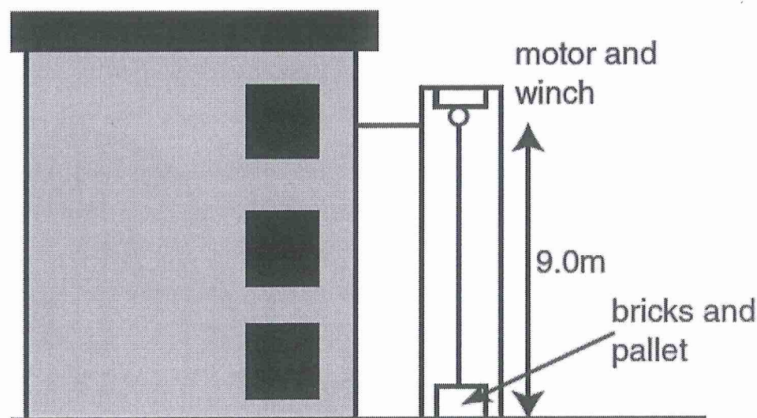
Assuming momentum is conserved. Calculate the speed of the balls after the collision. (3 marks)

Q4. A crane lifts a box upwards with a vertical force of 1500 N to a height of 6.1 m, as shown in the diagram below.



- a. Show that the work done on the box is 9150 J. (1 mark)
- b. If the power used by the crane is 7625 Watts to lift the box.
Calculate the time taken to lift the box. (2 marks)

Q5. A rope attached to a mechanical winch lifts a pallet of bricks from street level up to the second floor, a vertical displacement of 9.0 m, of a new block of apartments. The combined mass of the pallet and bricks is 930 kg. The time taken to lift the bricks at a constant speed from street level to the second floor is 14 s.



- a. Calculate the increase in the potential energy of the bricks and pallet. (2 marks)
- b. Show that the power used in lifting the pallet and bricks is 5.86 kW. (1 mark)
- c. If the winch motor is consuming electrical energy at 7.45 kW to lift the pallet and bricks as above, calculate the % efficiency of the motor. (2 marks)
- d. If the pallet and bricks are lifted up at a constant rate of 0.2 ms^{-2} , calculate the work required by the winch motor. (2 marks)

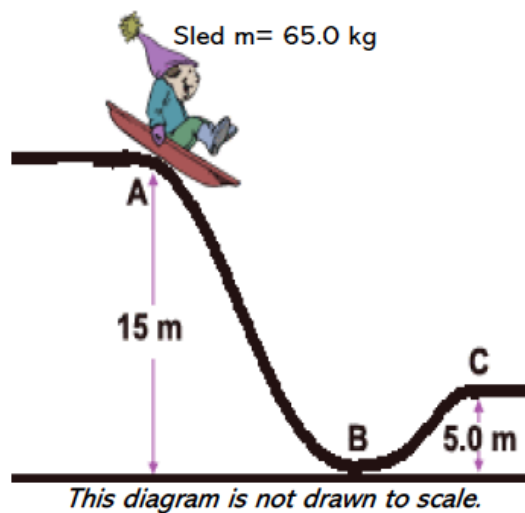
Q6. A boat that moves with a speed of 16.0 ms^{-1} has 325 kJ of energy, as shown below.



Calculate the mass of the boat.

(2 marks)

Q7. A sled with a total mass of 65.0 kg, slides along an ice ramp, shown below:



- Show the potential energy of the sled at A is equal to 9555 J. (1 mark)
- Hence using conservation of energy, calculate the speed of the sled at point C at a height of 5.0m. (2 marks)

Q8. Describe 3 energy transformations in the diagram shown below:

(3 marks)



Q9. 8. An iron bar of mass 2.30 kg is heated in a forge, as shown in the photo below. The iron bar has an initial temperature of 42.0°C and a final temperature of 395°C.



Image: Heating a 2.30 kg iron bar in a forge.

The specific heat capacity of iron, $c_{\text{iron}} = 450 \text{ J Kg}^{-1}\text{K}^{-1}$

Calculate the amount of heat required to increase the temperature of the iron bar.

(2 marks)

Q10. A beaker of 0.194 kg saltwater at 21.5°C is heated to 58.2°C, gaining 28400 J of energy. Calculate the specific heat capacity of the saltwater.

(2 marks)

Q11. Gallium is a metal with a relatively low melting point of 29.8°C.

- a. Calculate the quantity of heat required to melt a 3.5 g sample of gallium at 29.8°C.
Gallium's latent heat of fusion is $8.0 \times 10^4 \text{ J kg}^{-1}$.

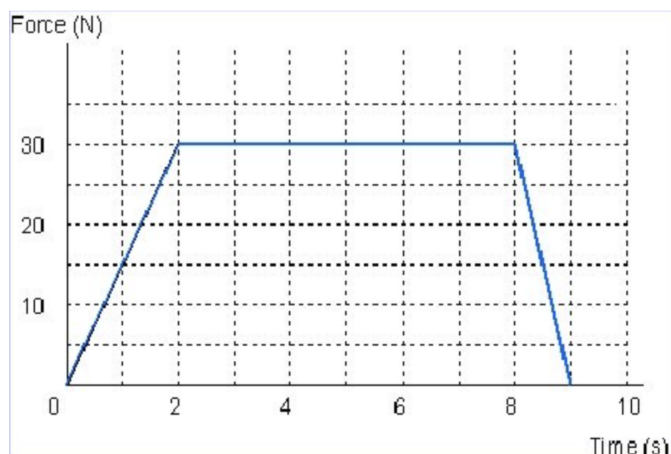
(2 marks)

Part B [18 marks]

Questions to assess IAE2 – representing data/results

Marks are allocated for showing clear and logical working out.

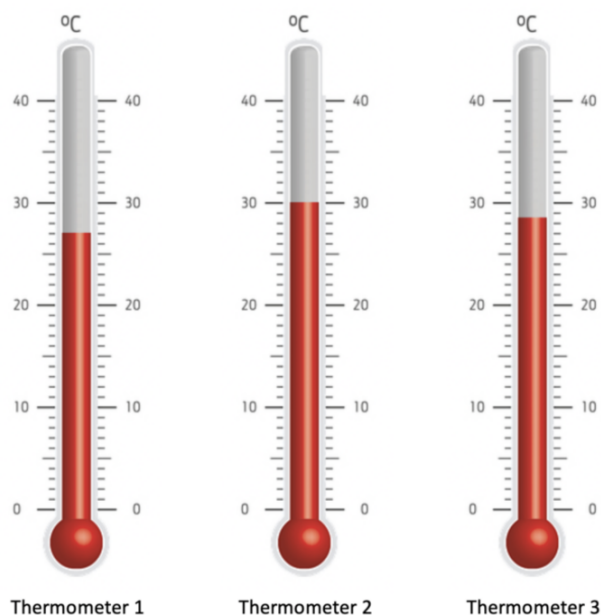
- Q12.** The graph shows how the force acting on an object changes over a time of 9 seconds.
Using the graph, calculate the change in momentum (impulse) delivered by the force over the 9-second interval.
(2 marks)



- Q13.** An experiment is conducted to test the calibration of 3 different thermometers by placing them into the same liquid.

- a. Complete a result table using the temperature values from the 3 thermometers above. **Use consistent significant figures.**
(4 marks)

Thermometer	Temperature (°C)
1	
2	
3	
Average temperature (°C)	



- b. The true value of the liquid is measured with a sensor to be 29.3°C. Determine which thermometer 1, 2 or 3 shows the most *accurate* value and briefly explain why.
(2 marks)

Q14. Wei Min, a Physics student, performs an experiment to investigate Hooke's law by hanging different masses from a spring supported vertically and measuring the spring extension. She then plots the acquired data and the line of best fit on the graph below.

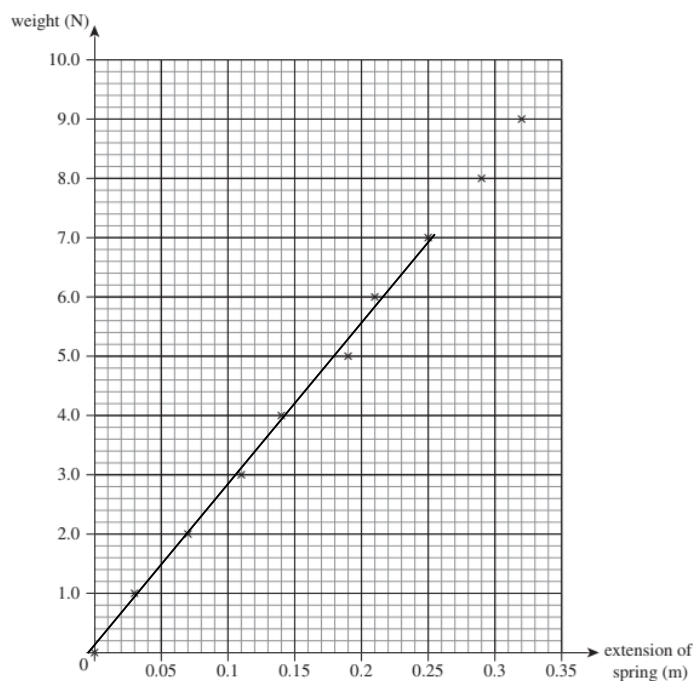
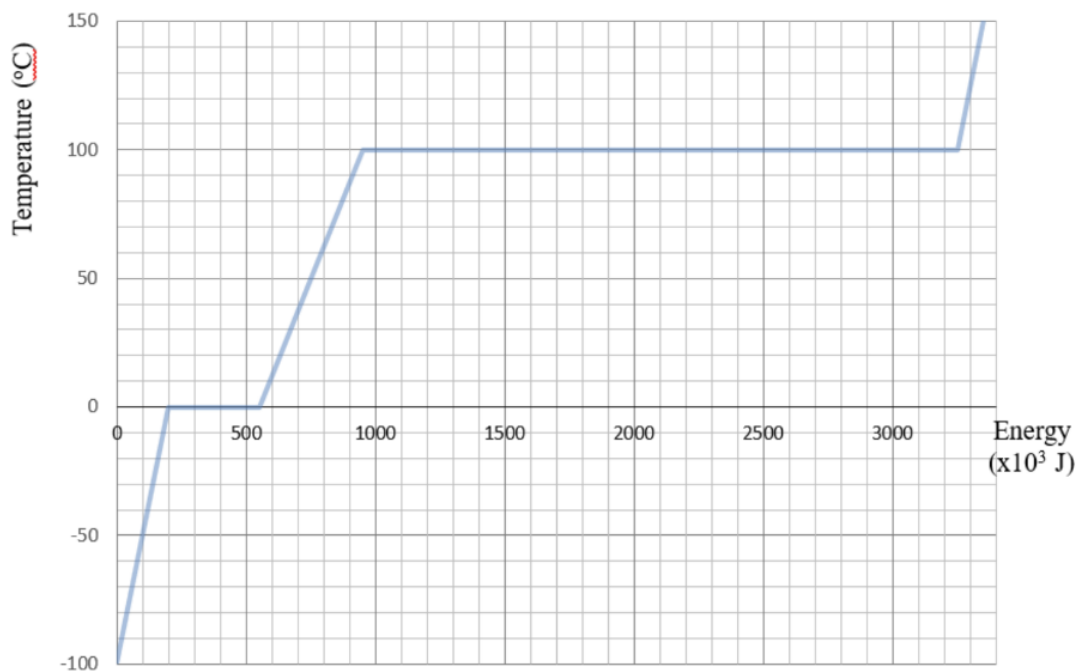


Figure 1

- Identify two errors Wei Min made in the above graph. (2 marks)
- Hooke's law states that the extension of a spring should be directly proportional to the force applied $W = kx$. Does the data shown in the graph support Hooke's law? Briefly explain your answer. (2 marks)
- Estimate the spring constant k , knowing that $W = kx$ (W is the total mass weight, x is the extension of spring) (2 marks)

Q15. The graph plots the heating curve of a block of ice. The energy ($\times 10^3$ J) is plotted against the temperature ($^{\circ}\text{C}$). It is known that water vaporises into steam at 100°C .



- Using the above graph, determine the amount of heat energy required to convert water at 100°C to steam at 100°C . (2 marks)

b. Hence, calculate the mass of the water.

(2 marks)

Part C [8 marks]

Questions to assess KA3 - Science as a Human Endeavour

Q16. Different types of thermometers are shown on the right. Describe 2 uses for thermometers in everyday life. (2 marks)



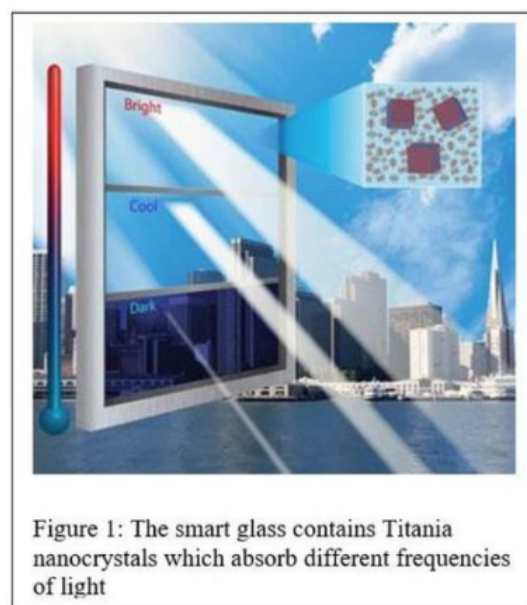
Different types of thermometers

Q17. Read the information in the article below, and use this information to answer the questions below.
(Article sourced from *Scientific American* (scientificamerican.com), 2018)

"Researchers have developed a material that can do just that. And, for those living in colder environments, this material can also switch modes to block the sunlight (and the glare it sometimes comes with) while still letting in the heat. By using this material in "smart windows", you could reduce home energy use by taking full advantage of both the heat and the visible light provided by the sun each day.

The material is a type of dual-band electrochromic material. "Dual-band" refers to the two types of nanocrystals contained within the material itself. In this case, the first nanocrystal allows you to block visible light while the second targets heat-producing infrared light. "Electrochromic" means that you can flip between light- and heat-blocking modes using a jolt of electricity.

This material was first described by researchers, including University of Texas Chemical Engineering Professor Delia Milliron, in an article in *Nature* in 2013. This month, Milliron and her team published a new article in the *Journal of the American Chemical Society*, which explores how an advanced version of this material could be built into a film for use on windows.



According to this paper, a window coating containing a single component — doped titania nanocrystals - can selectively block visible light or infrared radiation. It can also switch from heat- to light-blocking mode using a weak jolt of electricity in a matter of minutes (previous versions of the material could take hours to switch). All told, this material can block up to 80% of visible light or 90% of near-infrared light."

- Describe **two** benefits of the smart window. (2 marks)
- Use the information on page 8, to describe *two* examples of how the smart window and its materials demonstrate science as a human endeavour. (4 marks)