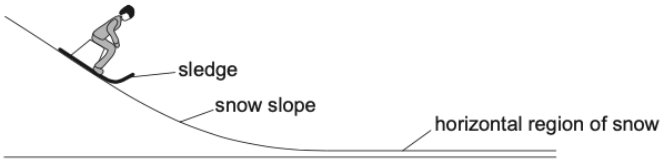
REVIEW

EXPECTED QUESTIONS

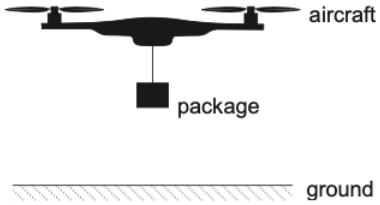
- Educated guess on what you might see on paper 2 on Thursday next week
- Based on previous papers and what has not been tested in a while
- Last years predictions to the G12s were very close (unlucky that they couldn't do the exam)

2. Inclined plane/fan or rocket question with conservation of momentum

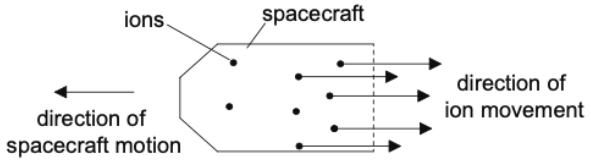
A girl on a sledge is moving down a snow slope at a uniform speed.



(a) Draw the free-body diagram for the sledge at the position shown on the snow slope. [2]

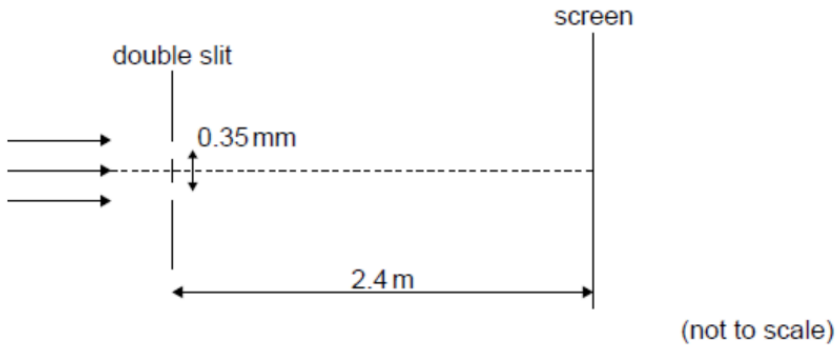


The air is propelled vertically downwards with speed *v*. The aircraft hovers motionless above the ground. A package is suspended from the aircraft on a string. The mass of the aircraft is 0.95 kg and the combined mass of the package and string is 0.45 kg. The mass of air pushed downwards by the blades in one second is 1.7 kg.



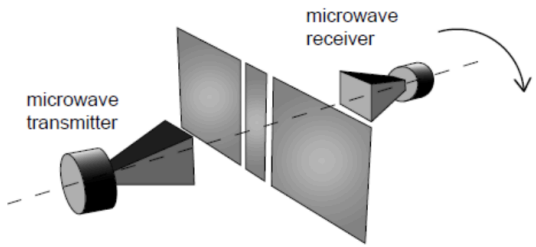
The mass of ions ejected each second is 6.6×10^{-6} kg and the speed of each ion is 5.2×10^{4} m s^{-1}. The initial total mass of the spacecraft and its fuel is 740 kg. Assume that the ions travel away from the spacecraft parallel to its direction of motion.

4. Double – slit/polarization/Snell's law



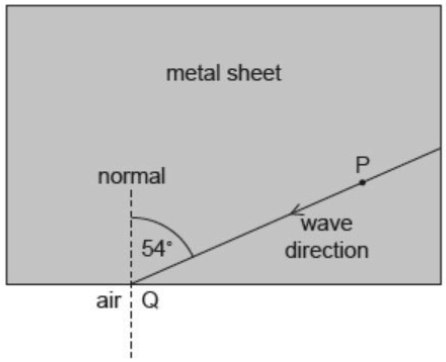
Calculate the wavelength of the light. Give your answer to an appropriate number of significant figures.

The microwaves emitted by the transmitter are horizontally polarized. The microwave receiver contains a polarizing filter. When the receiver is at position W it detects a maximum intensity.



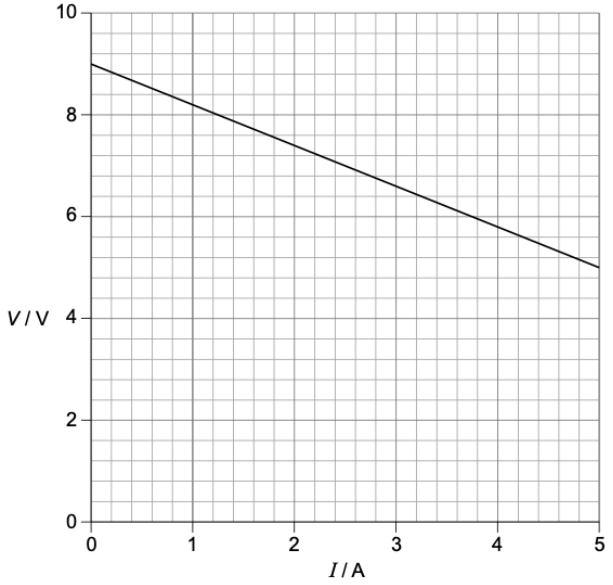
The receiver is then rotated through 180° about the horizontal dotted line passing through the microwave transmitter. Sketch a graph on the axes provided to show the variation of received intensity with rotation angle.

diagram not to scale

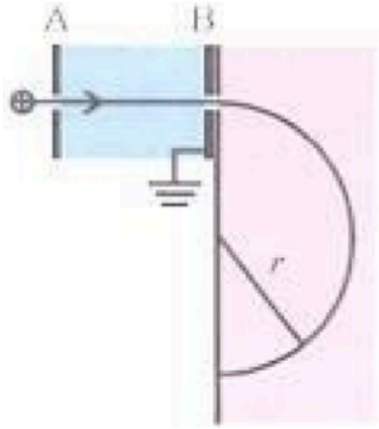


5. Internal resistance/parallel plates/circular motion connected to F= qvB

The student adjusts the variable resistor and takes readings from the ammeter and voltmeter. The graph shows the variation of the voltmeter reading V with the ammeter reading I.

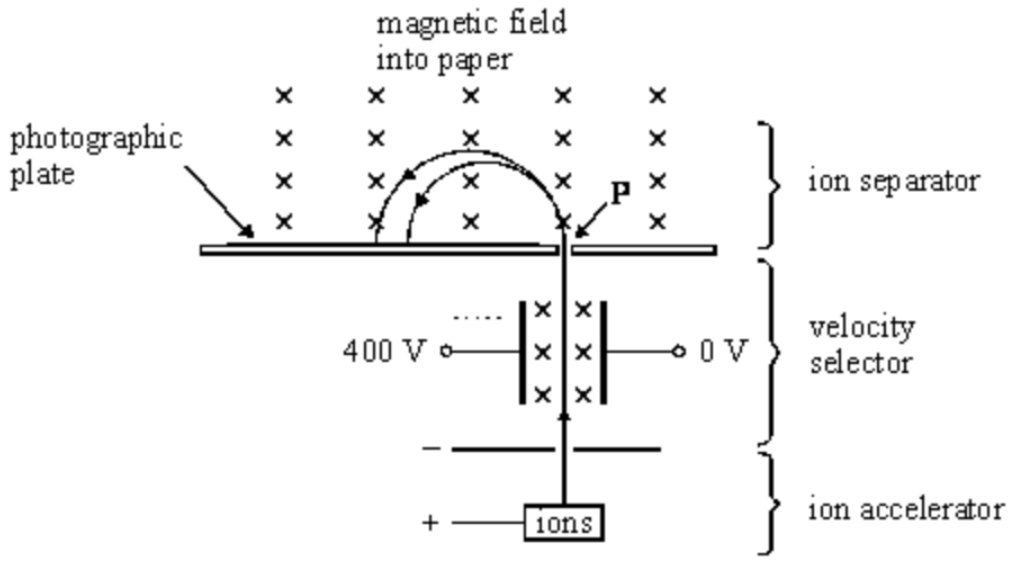


$^{12}C^{+}$ ions from an accelerator are accelerated to an energy of 65 keV. They are then directed in between two plates A and B, between which they are slowed down to a particular speed so that as the ions enter a magnetic field ($B = 0.146\ T$) the radius, r, of the path is 48 cm.



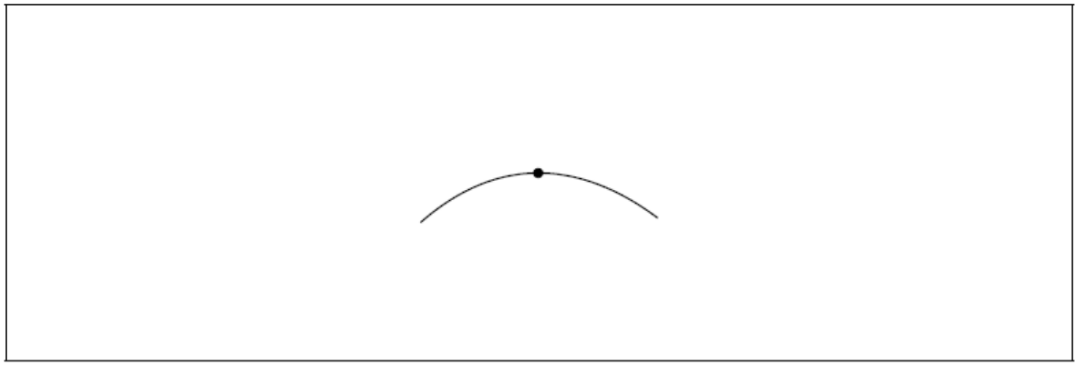
6. Mass spectrometer question? Considerations of forces in a vertical loop/hill

The diagram below shows a diagram of a mass spectrometer.

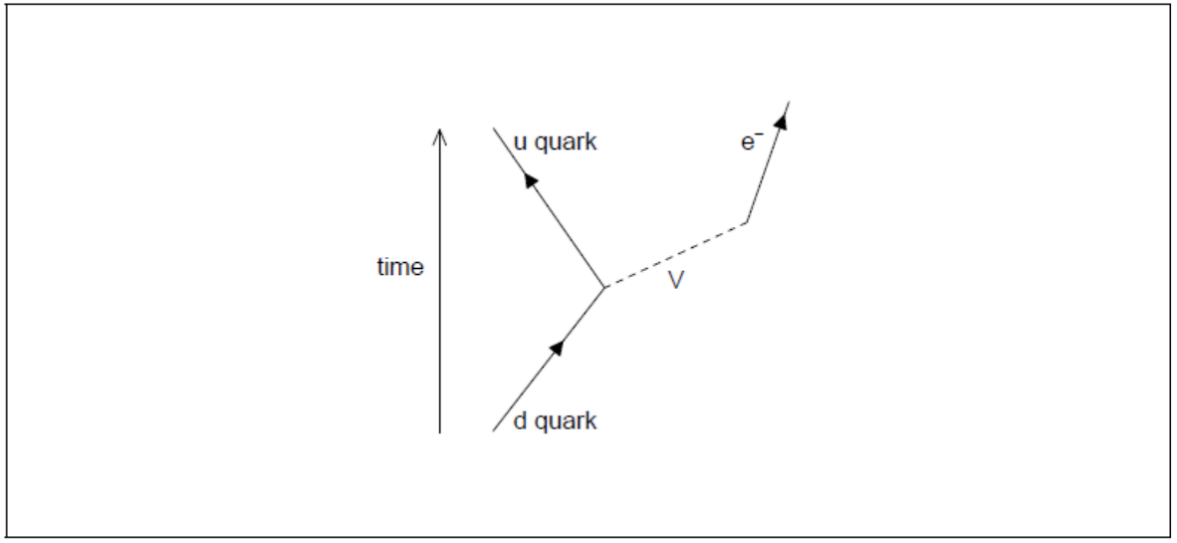


.The dot on the following diagram represents the skier as she passes point B.

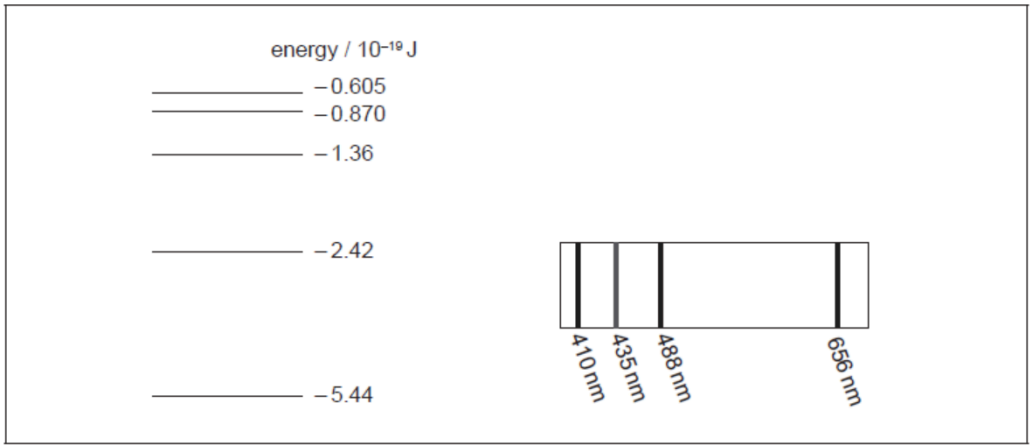
Draw and label the vertical forces acting on the skier.



7. Feynman diagram/energy levels of an electron (less common but haven't been tested in a while)

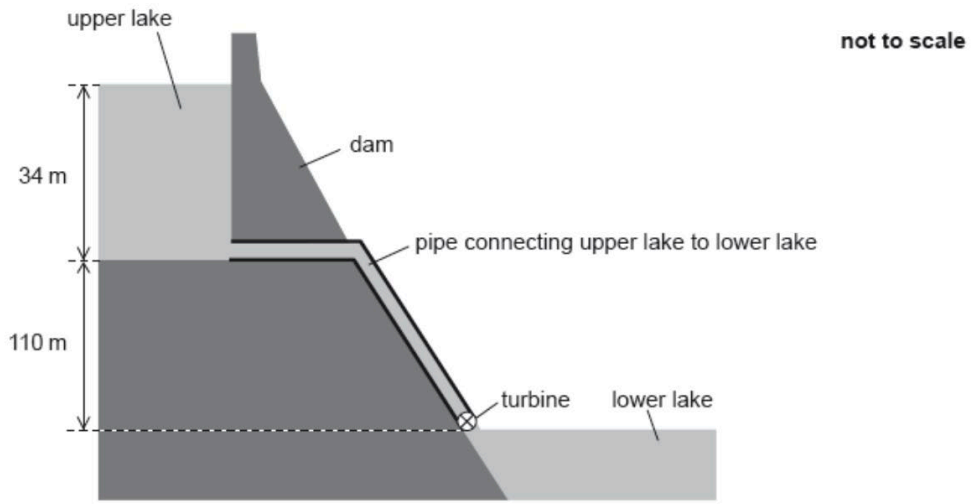


The diagram shows the position of the principal lines in the visible spectrum of atomic hydrogen and some of the corresponding energy levels of the hydrogen atom.



8. Pumped storage/wind energy questions

In a pumped storage hydroelectric system, water is stored in a dam of depth 34 m.

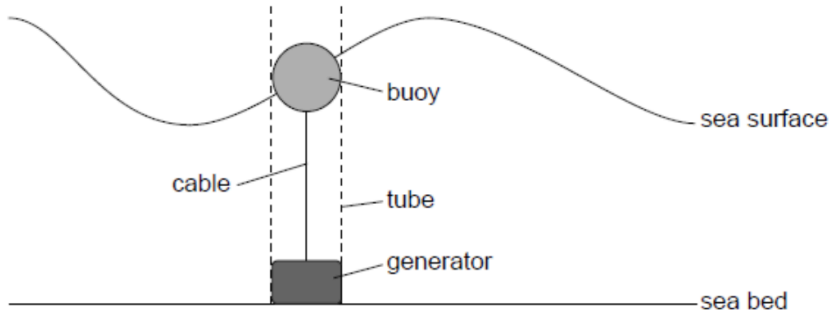


Wind is incident on the blades of a wind turbine. The radius of the blades is 12m. The following data are available for the air immediately before and after impact with the blades.

	Before	After
Density of air	$1.20\,kg\,m^{-3}$	$1.32\,kg\,m^{-3}$
Wind speed	$8.0\,m\,s^{-1}$	$4.0\,m\,s^{-1}$

9. Doppler effect/SHM (however, both were N21)

A buoy, floating in a vertical tube, generates energy from the movement of water waves on the surface of the sea. When the buoy moves up, a cable turns a generator on the sea bed producing power. When the buoy moves down, the cable is wound in by a mechanism in the generator and no power is produced.

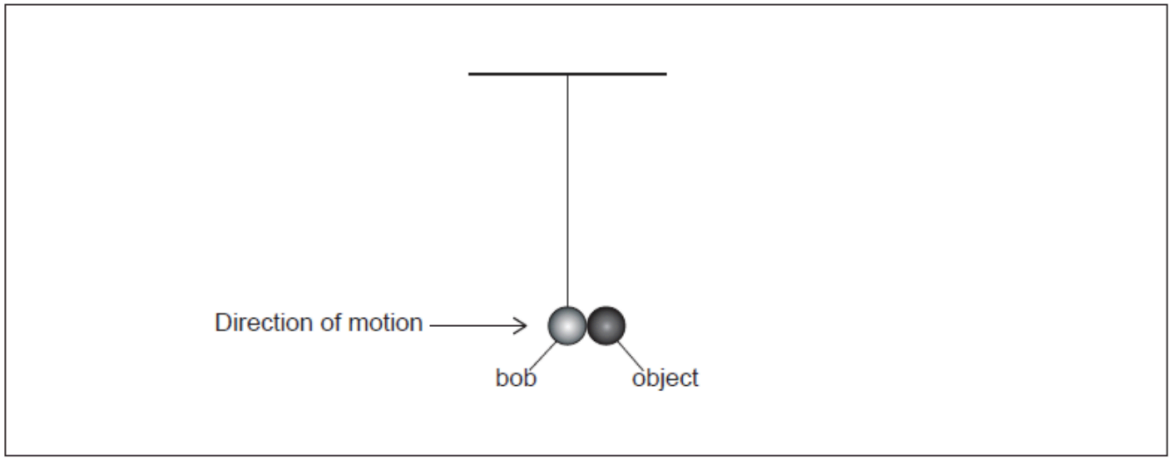


The motion of the buoy can be assumed to be simple harmonic.

Water can be used in other ways to generate energy.

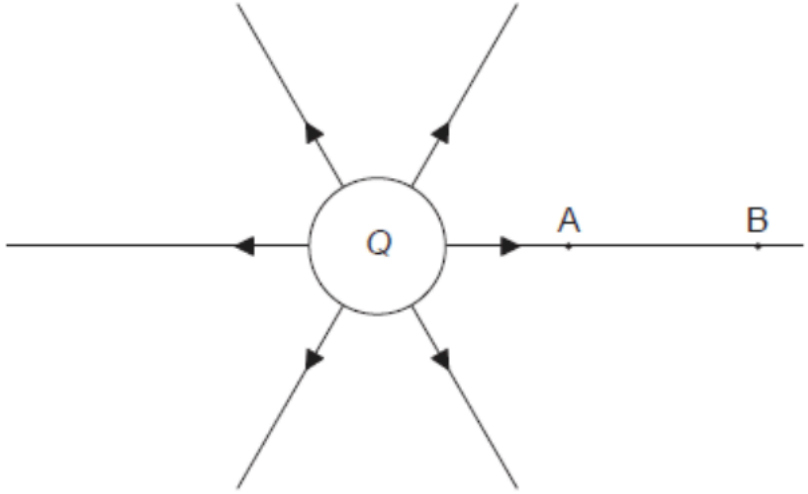
a. Outline the conditions necessary for simple harmonic motion (SHM) to occur.

When the 75 g bob is moving horizontally at 0.80 m s^{-1}, it collides with a small stationary object also of mass 75 g. The object and the bob stick together.



10. Electric potential (also involving graphs)

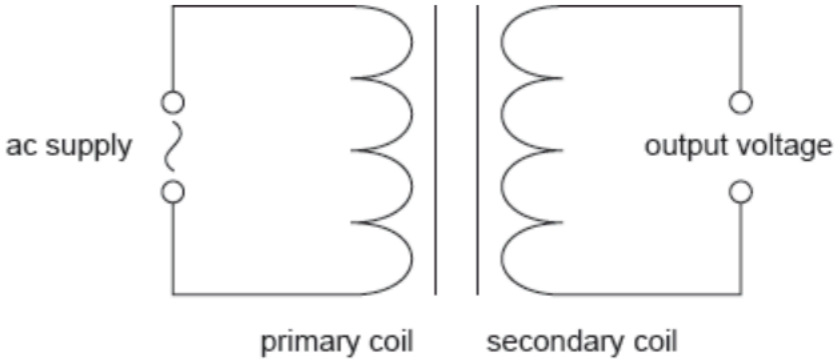
The diagram shows the electric field lines of a positively charged conducting sphere of radius R and charge Q.



Points A and B are located on the same field line.

11. Primary and secondary coils & power transmission

d. In a different circuit, a transformer is connected to an alternating current (ac) supply.



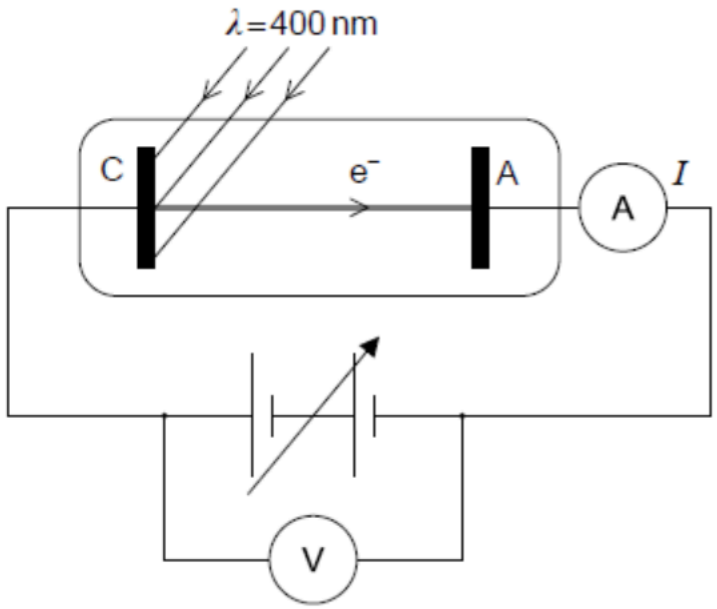
The transformer has 100 turns in the primary coil and 1200 turns in the secondary coil. The peak value of the voltage of the ac supply is 220 V. Determine the root mean square (rms) value of the output voltage.

[3]

e. Describe the use of transformers in electrical power distribution.

12. Photoelectric effect (also involving graphs)

An apparatus is used to investigate the photoelectric effect. A caesium cathode C is illuminated by a variable light source. A variable power supply is connected between C and the collecting anode A. The photoelectric current *I* is measured using an ammeter.



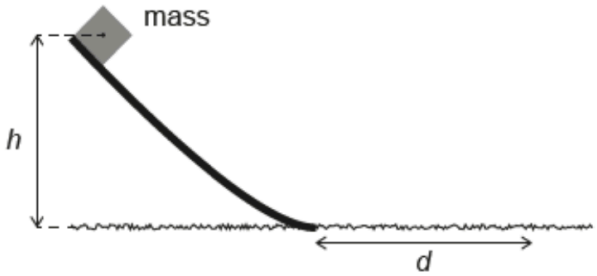
PAPER 1 STRATEGIES

- Checking the units
- ”find the odd one out” – if it exists

UNITS

Without finding the correct answer – which two alternatives cannot be correct?

A mass is released from the top of a smooth ramp of height h. After leaving the ramp, the mass slides on a rough horizontal surface. *[1 mark]*



The mass comes to rest in a distance *d*. What is the coefficient of dynamic friction between the mass and the horizontal surface?

A. $\frac{gd}{h}$

B. $\sqrt{\frac{d}{2gh}}$

C. $\frac{d}{h}$

D. $\frac{h}{d}$

UNITS

These questions can be recognized from the alternatives – they give different units

A. $\sqrt{\frac{k}{F}}$

B. $\frac{k}{F}$

C. $\frac{F}{k}$

D. $\sqrt{\frac{F}{k}}$

A. z

B. $\frac{z}{m}$

C. mz

D. $\frac{m}{z}$

A. $\frac{mv^2}{r}$

B. mv^2rg

C. $\frac{mgv^2}{r}$

D. $\frac{mv^2}{gr}$

Not in every exam

FIND THE ODD ONE OUT

In these questions, either all are correct or exactly two are correct

If you can find one statement that is incorrect you can stop reading since you know the answer now!

A liquid is vaporized to a gas at a constant temperature. *[1 mark]*

Three quantities of the substance are the

I. total intermolecular potential energy
II. root mean square speed of the molecules
III. average distance between the molecules.

Which quantities are **greater** for the substance in the gas phase compared to the liquid phase?

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

DO NOW

One the website:

- Paper 2 expected questions (196 marks)
- Paper 1 strategies (8 unit questions and 18 find the odd one out questions)