Name: _____

Circular Motion

Date:

Time:

Total marks available:

Total marks achieved: _____

Questions

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The force that keeps an object moving in a circular path is known as the

(1)

☒ **A** balancing force

☒ **B** centripetal force

☒ **C** reaction force

☒ **D** resistance force

(Total for question = 1 mark)

Q2.

Figure 11 shows an object moving in a circular path.

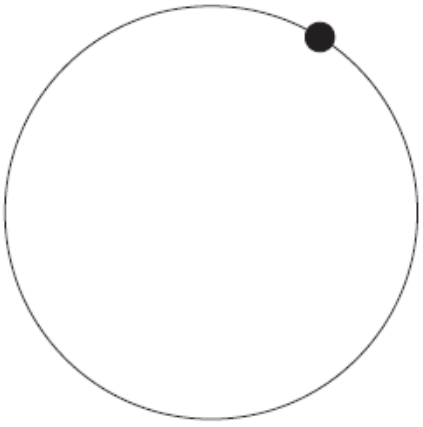

Figure 11

(i) Draw an arrow on Figure 11 to show the direction of the force that keeps the object moving in a circular path.

(1)

(ii) The object in Figure 11 is moving at constant speed.

Explain why it is not moving with constant velocity.

(2)

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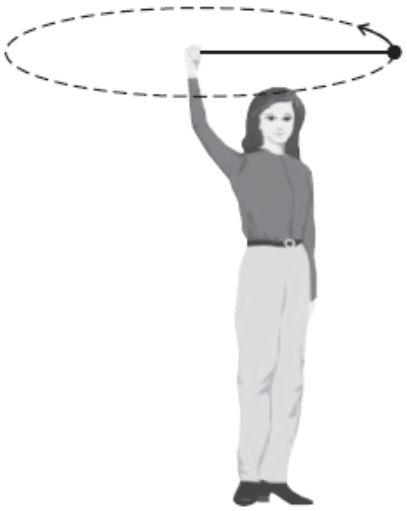
(Total for question = 3 marks)

Q3.

(a) The diagram shows a girl swinging a rubber ball in a horizontal circle above her head.



(i) In which direction does the resultant force act on the ball?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** away from the centre of the circle

☒ **B** in the direction of the arrow on the diagram

☒ **C** in the opposite direction to the arrow on the diagram

☒ **D** towards the centre of the circle

(ii) State the name of the resultant force acting on the ball.

(1)

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(iii) Suggest what would happen to the ball as the girl gets tired.

(2)

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(iv) The girl lets go of the string and the ball hits a wall.

The collision is not elastic.

Explain what happens to both momentum and kinetic energy when the ball hits the wall.

(2)

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*(b) Describe a cyclotron and how charged particles move inside it.

You may draw a labelled diagram to help with your answer.

(6)

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(Total for Question = 12 marks)

Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
	☒ B centripetal force **The only correct answer is B (correct term for circular motion)** **A** is not correct – incorrect term **C** is not correct – incorrect term **D** is not correct – incorrect term		**(1)**

Q2.

Question Number	Answer	Additional guidance	Mark
(i)	single arrow towards centre of the circle applied to the object (1)	judge by eye	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	an explanation including velocity is a vector (1) (because) direction changes (1)	velocity has (magnitude and) direction / velocity is speed in a (certain) direction	**(2)**

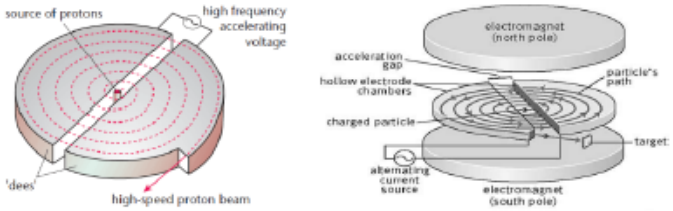
Q3.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	D towards the centre of the circle		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	centripetal (force)	reject centrifugal force accept misspellings where meaning is clear e.g. centripedal	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	Any two of the following :- ball slows down (1) ball / it drops (down) / circles at a lower height (1) go in smaller circles (1)	 less **kinetic** energy / momentum any lowering / less **potential** energy stops going in circles the ball/it would not make complete circles (not just 'stops')	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	An explanation linking: • the idea that momentum (of the closed system) would stay the same (1) • the idea that kinetic energy would not be conserved (1)	 momentum **of the ball** decreases / changes (direction) / passed to wall must specify which momentum; do not credit 'momentum decreases' by itself kinetic energy → heat/sound/wall ignore 'KE decreases / is lost' without qualification allow 'KE is lost because it's not elastic' (i.e. qualified)	**(2)**

Question Number		Indicative Content	Mark
QWC	*** (b)**	A description including some of the following points :- Cyclotron • two D-shaped halves • gap between the Dees • (alternating) voltage across the gap • magnetic field (at right angles to the moving particles) • vacuum enables free movement of particles Particle movement • accelerate • start at the centre • move in a circular path • spiral outwards • exit in a straight line Examples of labelled diagrams which would give Level 3 by themselves (not all labels / details needed)  Level 2 if no labels but Dees AND particle path shown. Level 1 if no labels but either Dees OR spiral of particle shown Ignore uses of cyclotron	**(6)**

Level	**0**	No rewardable content
1	**1 - 2**	• a limited description of either particle movement OR cyclotron e.g. The particles move in a circle OR Cyclotrons have two Dees OR Cyclotrons are particle accelerators OR there's a vacuum • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple description of particle movement AND cyclotron OR a more detailed description of one e.g. A cyclotron has two D-shaped halves and the particles inside accelerate OR A cyclotron has a magnetic field and a voltage across the gap OR Charged particles increase in speed as they spiral outwards OR vacuum allows free movement of particles • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a description of particle movement AND cyclotron with a detailed description of one of them e.g. the charged particles get faster as they accelerate across the gap in the Dees **OR** the magnetic field (of the cyclotron) causes the particles to move in a circle • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(Total for Question = 12 marks)